

GRADE

5



STUDY GUIDE

Texas Assessment of Knowledge and Skills

Science



A Student and Family Guide to Grade 5 Science



TAKS STUDY GUIDE

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Grade 5

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A Student and Family Guide

Dear Student and Parent:

The Texas Assessment of Knowledge and Skills (TAKS) is a comprehensive testing program for public school students in grades 3–11. TAKS replaces the Texas Assessment of Academic Skills (TAAS) and is designed to measure to what extent a student has learned, understood, and is able to apply the important concepts and skills expected at each tested grade level. In addition, the test can provide valuable feedback to students, parents, and schools about student progress from grade to grade.

Students are tested in mathematics in grades 3–11; reading in grades 3–9; writing in grades 4 and 7; English language arts in grades 10 and 11; science in grades 5, 8, 10, and 11; and social studies in grades 8, 10, and 11. Every TAKS test is directly linked to the Texas Essential Knowledge and Skills (TEKS) curriculum. The TEKS is the state-mandated curriculum for Texas public school students. Essential knowledge and skills taught at each grade build upon the material learned in previous grades. By developing the academic skills specified in the TEKS, students can build a strong foundation for future success.

The Texas Education Agency has developed this study guide to help students strengthen the TEKS-based skills that are taught in class and tested on TAKS. The guide is designed for students to use on their own or for students and families to work through together. Concepts are presented in a variety of ways that will help students review the information and skills they need to be successful on the TAKS. Every guide includes explanations, practice questions, detailed answer keys, and student activities. At the end of this study guide is an evaluation form for you to complete and mail back when you have finished the guide. Your comments will help us improve future versions of this guide.

There are a number of resources available for students and families who would like more information about the TAKS testing program. Information booklets are available for every TAKS subject and grade. Brochures are also available that explain the Student Success Initiative promotion requirements and the new graduation requirements for eleventh-grade students. To obtain copies of these resources or to learn more about the testing program, please contact your school or visit the Texas Education Agency website at www.tea.state.tx.us.

Texas is proud of the progress our students have made as they strive to reach their academic goals. We hope the study guides will help foster student learning, growth, and success in all of the TAKS subject areas.

Sincerely,



Lisa Chandler
Director of Student Assessment
Texas Education Agency

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SCIENCE

INTRODUCTION

How is the Science Study Guide organized?

Four objectives are tested on the elementary science Grade 5 TAKS test. This study guide therefore is organized into four main parts, one for each objective.

- Objective 1: The Nature of Science
- Objective 2: Life Science
- Objective 3: Physical Science
- Objective 4: Earth Science

For each objective there is a review and a set of practice questions. Start by reading the review for each objective. After you read the review, you can test your knowledge of the objective by trying the practice questions.

Will this study guide tell me everything I need to know about science?

No, but it's a great place to review what you've learned in school. This study guide explains some, but not all, of the science ideas that you need to know and understand. You can also increase your science knowledge by studying:

- Science books from your school or library
- Your science journals
- Science tests, quizzes, and activity sheets
- Classroom science investigations

What kinds of practice questions are in the Science Study Guide?

The science study guide contains questions similar to those found on the elementary science Grade 5 TAKS test. There are three types of questions in the science study guide.

- **Multiple-Choice Questions:** Most of the practice questions are multiple-choice items with four answer choices. Many of these questions follow a short passage, a chart, a diagram, or a combination of these. Read each passage carefully. If there is a chart or diagram, study it. Passages, charts, and diagrams usually contain details and other information that will help you answer the question. Then read the question carefully and consider what you are being asked. Read **each** answer choice before you choose the **best** answer.

It's always a good idea to reread the question after you have thought about each answer choice.

- **Griddable Questions:** Some practice questions use a four-column answer grid like the ones used on the Grade 5 mathematics TAKS test. Griddable practice questions ask you to measure something or use math to solve a science problem. You will see an example of a griddable question on page 51.
- **Cluster Questions:** Some multiple-choice questions are grouped together in clusters. Each cluster begins with a *stimulus* that may include a passage, a diagram, a chart, or a combination of these. The information in the stimulus will help you focus on the cluster questions.

The stimulus is followed by two to five multiple-choice questions. The cluster questions usually test several different science objectives, but they are all related to the stimulus. To answer the cluster questions, you will need to use information from the stimulus as well as your own knowledge of science, so read and study the stimulus carefully before you answer the cluster questions. Then think about what you already know from your study of science. You will see examples of science clusters on pages 66–69.

How do I use an answer grid?

Because the answer grid contains three columns of numbers, your answer will always be a whole number with one, two, or three digits. Let's say you are asked to use a ruler to measure the length of a crystal to the nearest centimeter. If the crystal is 9 centimeters long, you should write the number 9 at the top of the ones column on the answer grid. Be careful not to write a 9 in the tens or hundreds column. Then fill in the bubble marked 9 in the ones column. Find the 9 bubble and darken the circle that contains the number 9. Check to make sure that you bubbled in the same number that you wrote at the top of the grid.

hundreds	tens	ones	.
0	0	0	
1	1	1	
2	2	2	
3	3	3	
4	4	4	
5	5	5	
6	6	6	
7	7	7	
8	8	8	
9	9	9	

		9	.
0	0	0	
1	1	1	
2	2	2	
3	3	3	
4	4	4	
5	5	5	
6	6	6	
7	7	7	
8	8	8	
9	9	●	

This is the grid found on the TAKS test.

How will I know whether I answered the practice questions correctly?

The answers to the practice questions are in an answer key at the back of this book (pages 74–80). For most questions, the answer key explains why each answer choice is correct or incorrect. After you answer the practice questions, you can check your answers to see how you did. If you chose the wrong answer to a question, carefully read the answer explanation to find out why your answer is incorrect. Then read the explanation for the correct answer.

If you still do not understand the correct answer, ask a friend, family member, or teacher for help. Even when you have chosen the correct answer, it is still a good idea to read the answer explanation. It may help you better understand why the answer is correct.

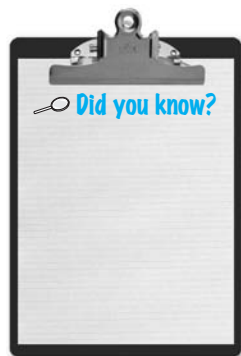
Is there anything else in the Science Study Guide?

Yes! There is a science activity called “Be a Trait Detective!” on page 70. You can do this activity at home. It will help you practice and strengthen some of the science skills that you’ll review in Objective 2 (Life Science). The review for Objective 2 begins on page 24. After you complete the activity, you can compare your results with the sample results on page 80.

Many of the review pages contain clipboards. The clipboards contain tips, helpful information, important facts, and interesting details.

Remember! clipboards contain information that you have probably learned before. They are reminders to help refresh your memory.

Did you know? clipboards contain fun science facts that are probably not familiar to you.



How do I use this study guide?

First look at your Confidential Student Report. Your report shows your TAKS score for each science objective. If you did not pass a science objective, you should start your review with that objective. You can look at the table of contents at the beginning of this study guide to locate the page on which each objective review begins.

Carefully read the review section. If you do not understand something, ask for help. Then answer the practice questions. Use the answer key at the back of this study guide to check your answers. It is a good idea to read all four reviews and answer all the practice questions, even if you passed some of these objectives. Study at a speed that is comfortable for you. The Science Study Guide contains a lot of information. If you plan to read all the reviews and answer all the practice questions, you may want to allow yourself several weeks.

Objective 1

The student will demonstrate an understanding of the nature of science.

From your studies in science, you should be able to show an understanding of the nature of science.

The nature of science? What's that? Isn't nature just the outdoors?

When people talk about nature, they often do mean the outdoors. But that's not what we mean when we talk about the nature of science. The nature of science has to do with what science is and how scientists learn about the world.

So what exactly is science?

Science includes all that we know about the natural world and the universe. The information in your science textbook is part of science. Asking a question about the natural world and making a plan to find the answer is science too. So science isn't just something you know. It's also something you do.

Well, that's great to know. But I'm not a scientist. I'm just a kid. Why do I need to understand science?

Anyone can study the world around us. I'll bet you're a scientist and you don't even know it! Go ahead. Ask a question about something you would really like to know.

Is it going to rain during my soccer game tomorrow? How's that for a science question?

Very good! How will you find out whether it might rain tomorrow?

I'll listen to the weather report on the radio. Then I'll look out the window in the morning and see whether it's cloudy.

Who says you're not a scientist? You asked a question, and you made a plan to find the answer to your question. Ordinary people like you and me do science every day. Even scientists who make great discoveries start out by doing just what you did. They wonder about something and ask a question. Then they come up with a plan for finding the answer.

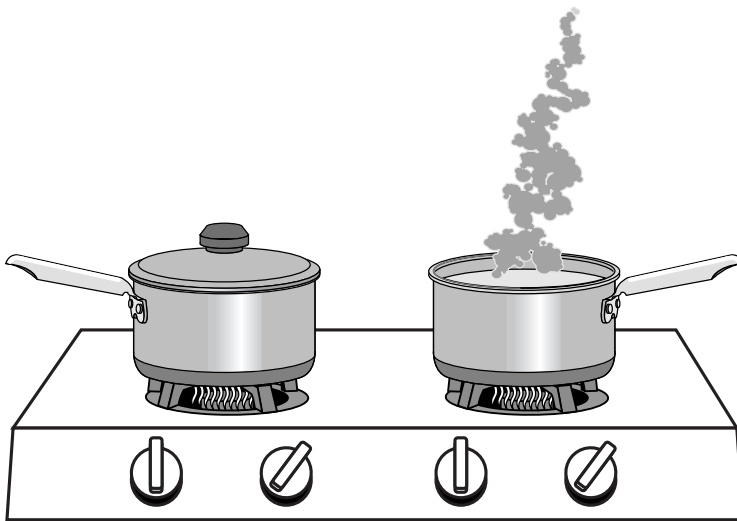
There are many different ways to find answers in science. You can observe the world around you and write down what you see. You can experiment. You can even ask someone who is an expert.

O.K., I'm a scientist. But where do I start?

It all begins with noticing something that makes you wonder. Wondering about things usually causes you to ask questions. You ask, "Why did that happen?" or "How does that work?" or "What makes this different?" Observing and then asking questions are the first steps in getting started as a scientist.

I wonder about things. I ask questions. What's next?

Whoa! Not so fast! Let's talk about something that makes me wonder. I've noticed that a pot of water covered with a lid boils faster than a pot of water without a lid. This makes me think that the lid helps trap heat inside the pot. I wonder whether I could use a lid or a cover to trap heat from the sun.



The water in the covered pot boils first.

Let's ask a question. How about: "Can a jar with a cover trap more heat from the sun than a jar without a cover?"

How can we find out the answer to your question?

We need a plan. First of all, let's change my question into a statement that we can test. A statement that can be tested is called a *hypothesis*.

How about this for our hypothesis? **A jar with a cover traps more heat from the sun than a jar without a cover.** This is a statement that we can test, so it's a hypothesis.

Did you know?

Some scientists have made great discoveries by accident. Alexander Fleming discovered a lifesaving medicine called penicillin when he accidentally let a mold grow in his lab.

Objective 1

Can you give me an example of a statement that isn't a hypothesis?

Sure! How about this one? **Tomatoes taste better than green beans.** We can't test this statement in science because it's an opinion. Some people might agree with it, and some might not. We can't test a statement if we can't collect facts about it, so it's not a hypothesis. In this case we could collect only opinions about the statement.

Why do we have to test a hypothesis?

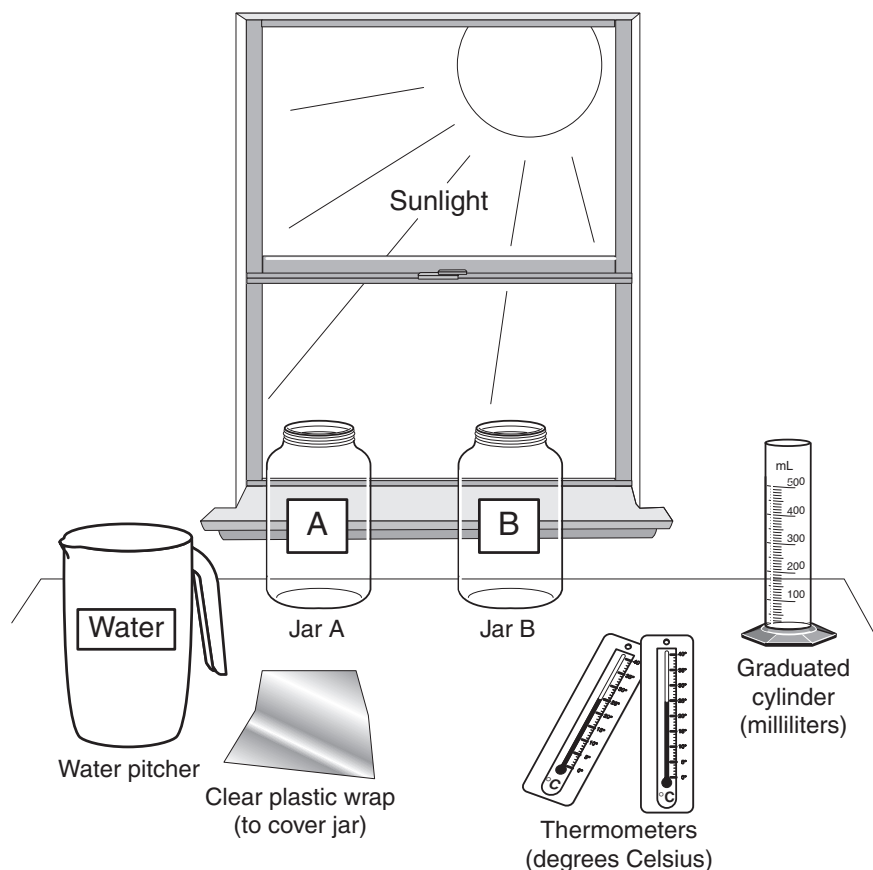
A hypothesis is really just a reasonable guess. It tells what you think will happen. When you test your hypothesis, you gather data, or information. You can then study this information to decide whether it supports your hypothesis.

O.K., so we're going to test our hypothesis. How are we going to do that?

We're going to conduct an experiment. Let's look at our hypothesis again. **A jar with a cover traps more heat from the sun than a jar without a cover.**

Scientists must choose the right equipment and materials for an experiment. Let's think about the materials we might need. From the hypothesis I see that we will need jars, a cover for one of the jars, sunlight, and something to measure heat with. A *thermometer* measures temperature, and temperature is related to heat. Let's use a thermometer!

Let's also put something inside the jars to hold heat. Water is a good choice. We'll need something to measure the amount of water, such as a graduated cylinder or a metric measuring cup.



The thermometers measure temperature in degrees Celsius, and the graduated cylinder measures volume in milliliters. Why can't we just use a Fahrenheit (°F) thermometer and measure the water in ounces (oz)?

I'm glad you asked. Scientists all around the world make their measurements in *SI units*, such as degrees Celsius and milliliters. SI units are used worldwide and are commonly called metric units. If all scientists use the same measurement system, anyone can understand their experiments, no matter what part of the world they live in. Using the same measurement system is kind of like speaking the same language.

Many people in the United States use customary units, such as degrees Fahrenheit and ounces. You probably use customary units at home. But scientists, even scientists in the United States, use the SI system.



Did you know?

"SI units" comes from French and stands for *Système International d'Unités*, the official name of the metric system.

Objective 1



Remember!

Mass is a measure of the amount of matter an object contains. Volume is the amount of space an object takes up.

What are some of the basic units of measurement in the SI system?

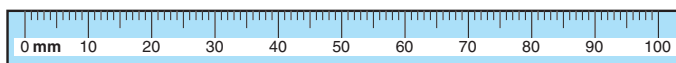
In the SI system, length is measured in meters, mass is measured in grams, and volume is measured in liters.

The tables show some SI units of length, mass, and volume.

Units in the SI System

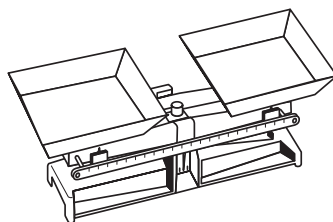
Length

Smaller Unit	Basic Unit	Larger Unit
millimeter (mm)	meter (m)	kilometer (km)
1,000 mm = 1 m		1 km = 1,000 m

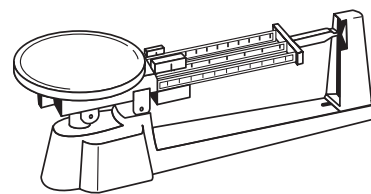


Mass

Smaller Unit	Basic Unit	Larger Unit
milligram (mg)	gram (g)	kilogram (kg)
1,000 mg = 1 g		1 kg = 1,000 g



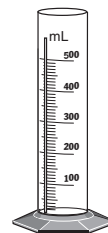
Double-pan balance



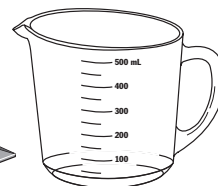
Triple-beam balance

Volume

Smaller Unit	Basic Unit
milliliter (mL)	liter (L)
1,000 mL = 1 L	



Graduated cylinder



Measuring cup

The SI system is based on the number 10 and multiples of 10, such as 100 and 1,000. This makes it easy to change from one unit to another unit.

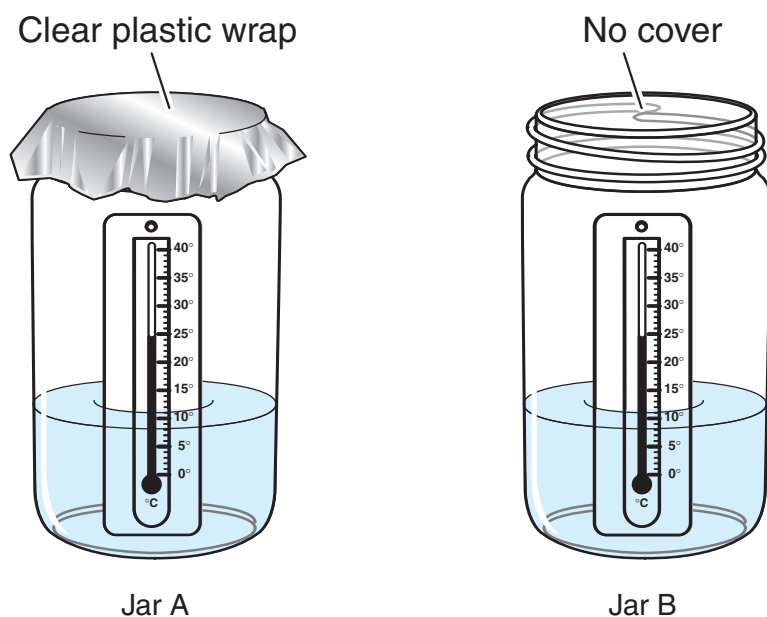
For ordinary lab measurements, scientists measure temperature in degrees Celsius ($^{\circ}\text{C}$). The freezing temperature of water is 0°C , and the boiling temperature of water is 100°C .

Let's get back to our experiment. How are we going to use our materials to test our hypothesis?

We want to find out whether a jar that is covered will trap more heat from the sun than a jar that is not covered. So let's set up two jars in exactly the same way. The only difference between the two jars will be that one will be covered and one won't.

Let's get busy. Here are the steps we'll follow.

- Create a table in which to record data. Our table will need spaces for us to write down the temperatures of each jar and the times the temperatures were measured.
- Place a thermometer in equal amounts of water in each jar.
- Cover the top of one jar with clear plastic wrap.
- Place both jars outside in bright sunlight.
- Measure the temperature of the water in each jar and then measure the temperature again every five minutes for a total of 30 minutes. Remember to record the numbers in the data table.

Experimental Setup**O.K., let's do it! Which one of us is going to write down our data?**

You take the first measurements. I want to watch a scientist at work!

Objective 1

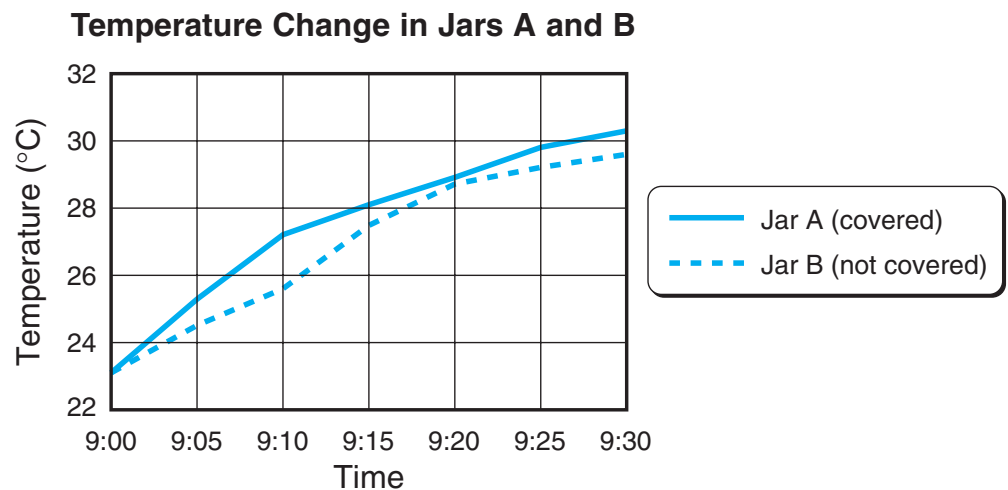
Wow! Look at the data we collected! Now we have lots of numbers. What do we do with them?

Now that we have data, we will analyze, or study, our results. One of the ways scientists look at their data is by making graphs or charts. Let's use the data from our table to make a line graph. A line graph will help us compare the temperatures of the two jars. *Line graphs* are used to compare changes in data as time passes.

Here is our data table.

Time	Temperature	
	Jar A (covered)	Jar B (not covered)
9:00	23.1°C	23.1°C
9:05	25.3°C	24.5°C
9:10	27.2°C	25.6°C
9:15	28.1°C	27.5°C
9:20	28.9°C	28.7°C
9:25	29.8°C	29.2°C
9:30	30.3°C	29.6°C

Here is how these data look on a graph.



The graph shows that the temperature of the covered jar was higher than the temperature of the uncovered jar. So now what?

Now we say that the evidence from our experiment supports our hypothesis that a jar with a cover will trap more heat from the sun than a jar without a cover.

Does that mean our hypothesis is true?

Not necessarily. The temperature difference between the two jars wasn't very much. And we performed only one experiment. Scientists often repeat their experiments to make sure that they get the same results each time.

We can't say that our hypothesis is true. But we can say that our hypothesis is supported by our data.

I'm glad our data supported our hypothesis. All of this could have been for nothing!

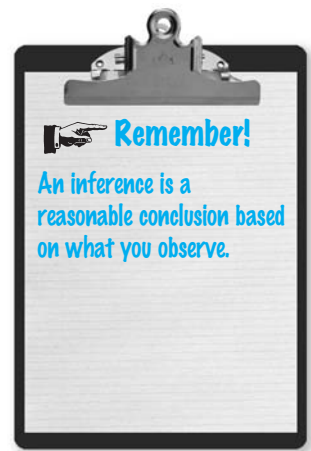
Not at all! Even when a hypothesis is not supported by the data, we still learn something. We learn that our hypothesis is probably false. A scientist would go back and think about the hypothesis, look at how the experiment was set up, and then try again.

What else can we learn from our jar experiment?

We can make an *inference*. At the beginning of the experiment, the only difference between the jars was that Jar A was covered. At the end of the experiment, Jar A was warmer than Jar B. We can infer that Jar A was warmer because it was covered. The cover helped keep heat from escaping from Jar A, much like the lid on a pot keeps heat from escaping.

This is super! In one day I did an experiment and became a scientist!

You have become something else too. You have become a model builder!



Objective 1

A model builder? I don't remember putting any model airplanes together. What are you talking about?

I'm not talking about model airplanes. I'm talking about scientific models. Models help scientists understand parts of the natural world that are difficult to study directly.

The natural world is often very complicated. A model is simple and cannot include everything that is in the natural world. For this reason, models have weaknesses. The more closely a model represents the natural world, the better the model.

Model of Earth



This is a model of Earth. The planet Earth is much too big for us to observe completely. For this reason, a globe can make it easier to learn about Earth.

Did you know?

If the atmosphere didn't trap heat from the sun, Earth's average temperature would be about -18°C , which would be well below freezing.

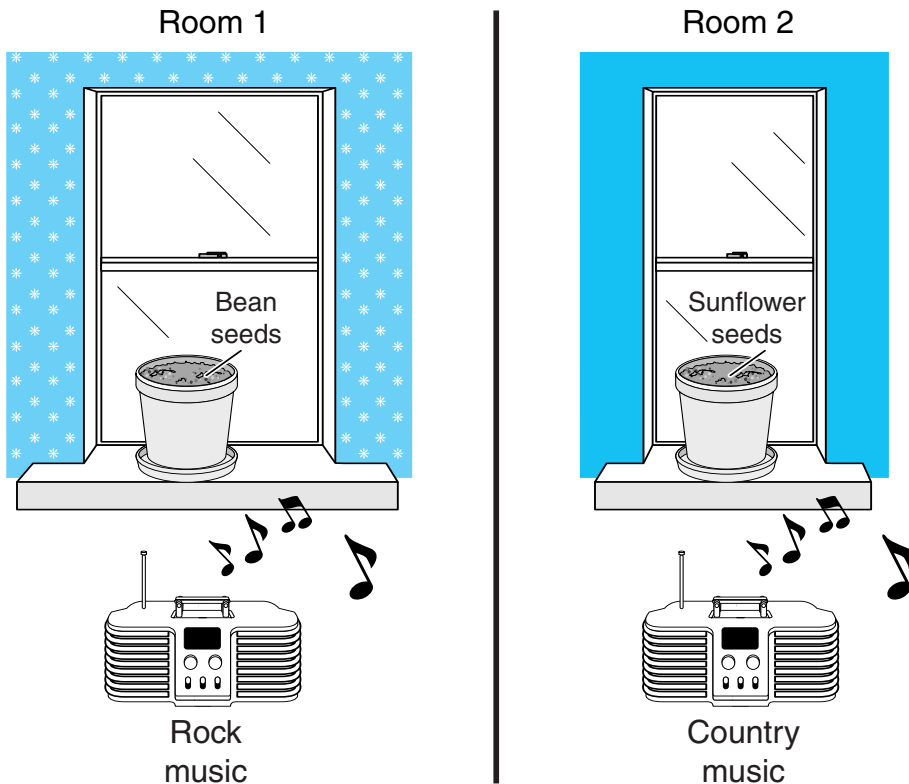
So what kind of model did I build?

You made a simple model of Earth's atmosphere! The atmosphere helps trap heat from the sun and keep it from escaping Earth. Your covered jar also trapped heat from the sun. So you could use Jar A as a model for Earth's atmosphere.

Do scientists ever make mistakes?

Of course! Just like everyone else, scientists make mistakes. Let's look at one experiment that wasn't planned very well.

Suppose some students wanted to test whether different types of music could make plants grow taller. They planted five bean seeds in one pot and five sunflower seeds in another pot. They put the pots in different rooms and played a different type of music in each room.



After two weeks the students found that the plants in Room 1 had grown taller than the plants in Room 2. They concluded that rock music makes plants grow taller than country music.

Do you see any problems with the students' experiment?

Objective 1

Yeah! They should have used the same type of seeds in each pot, right?

Right! The plants in Room 1 might have grown taller than the plants in Room 2 because the students used a different type of seed in each room. Also, the window in Room 1 is larger than the window in Room 2. The plants in Room 1 might have grown taller because they got more sunlight.

There are at least three possible reasons for the difference between the heights of the plants: (1) the type of seed, (2) the amount of sunlight, and (3) the type of music. The students have no way of knowing which of these affected the plants' growth.

How could the students have made their experiment better?

They should have done a better job of controlling *variables*. A variable is something that you can change in an experiment. For example, variables in the students' experiment include type of seed, amount of light, type of music, amount of water, and so on.

Because the students wanted to know how different types of music affect plant growth, they should have kept all the variables the same except for the type of music. They should have made sure that all the plants received the same amount of light, and they should have used the same type of seeds in each pot.

Another way the students could have improved their experiment is by adding a third group of plants and growing them in a quiet room. This third group would have been a *control group*. The control group would have shown the students how tall the plants grow without music. They could have compared the results for the first two groups to this control group.

What about our heat-trapping experiment with the jars? Did we control variables?

Yes, we did. The only variable we changed was whether the jars were covered. We made sure the jars had the same shape and size, the same amount of water, and the same amount of sunlight. We know that any differences in the temperatures of the jars were probably because Jar A had a cover and Jar B did not.

Now try a
few practice
questions to
see what you
have learned.

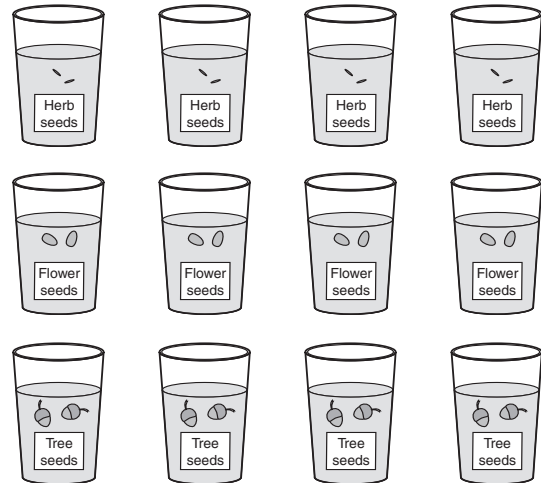


Now It's Your Turn

After you answer the practice questions, you can check your answers to see how you did. If you chose the wrong answer to a question, carefully read the answer explanation to find out why your answer is incorrect. Then read the explanation for the correct answer.

Question 1

A student has three different types of seeds. The student plants two seeds of each type against the side of clear plastic cups so that the seeds can be observed. All twelve cups are placed together in a sunny window, and each cup is given the same amount of water. The student records observations of the seeds at the same time every day in a data chart.



Which question is the student most likely trying to answer?

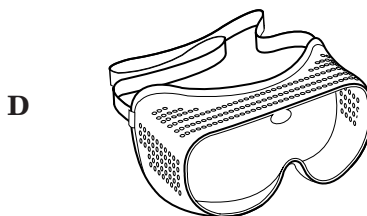
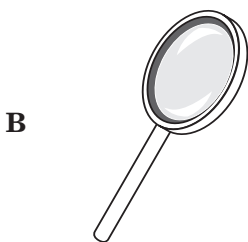
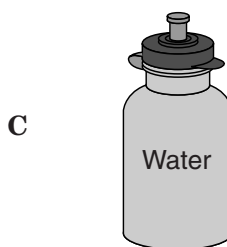
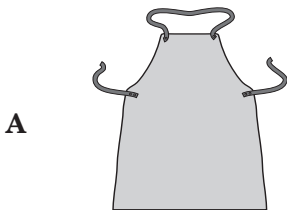
- A Do seeds need sunlight in order to sprout?
- B Will seeds sprout faster in clear plastic cups?
- C How much water do seeds need in order to sprout?
- D Do some kinds of seeds take longer to sprout than others?



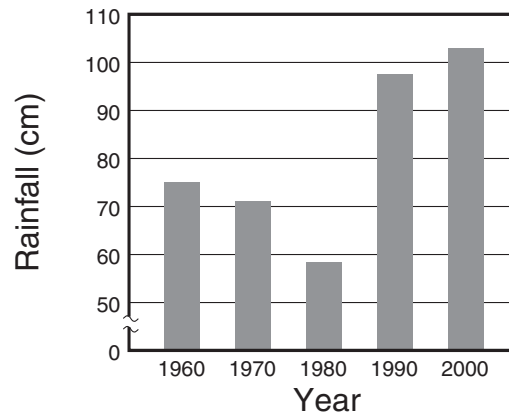
Answer Key: page 74

Question 2

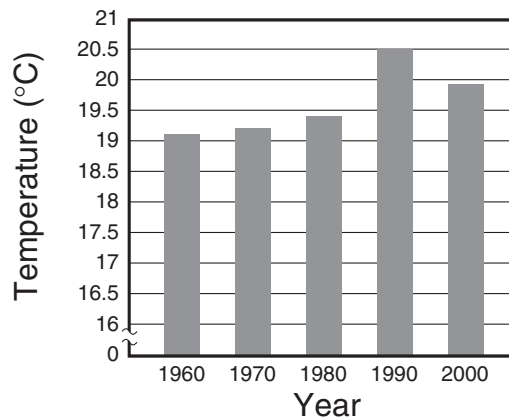
Students are doing an experiment in science class. Which piece of equipment will best protect the students' eyes during the experiment?



Answer Key: page 74

Question 3**Average Yearly Rainfall in Waco, Texas**

Source: National Weather Service

Average Yearly Temperature in Waco, Texas

Source: National Weather Service

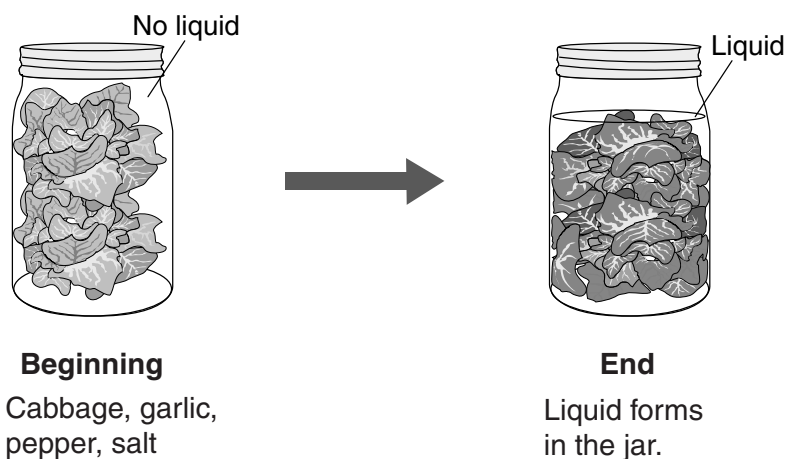
What do the graphs suggest about the average yearly rainfall and the average yearly temperature in Waco, Texas?

- A** Years with lower average rainfall are warmer.
- B** Years with lower average temperature have more rainfall.
- C** The average temperature is not related to the average rainfall.
- D** The average rainfall and the average temperature do not depend on the number of cloudy days.

**Answer Key: page 74**

Question 4

Kimchi is a Korean food made from cabbage, garlic, pepper, and salt. Some students made kimchi as part of a social studies lesson. They layered the ingredients in a two-liter jar until it was full. Then the students sealed the jar. After a few hours the jar began to fill with liquid. The students guessed that the liquid was coming from the cabbage. In their science class the students decided that they would conduct an investigation to find out what caused the liquid to leave the cabbage.



Which change in the investigation would have best helped the students find out what caused the liquid to leave the cabbage?

- A Using jars of different sizes
- B Using different amounts of cabbage
- C Leaving out one ingredient at a time
- D Replacing the cabbage with other vegetables



Answer Key: page 74

Question 5**Observations**

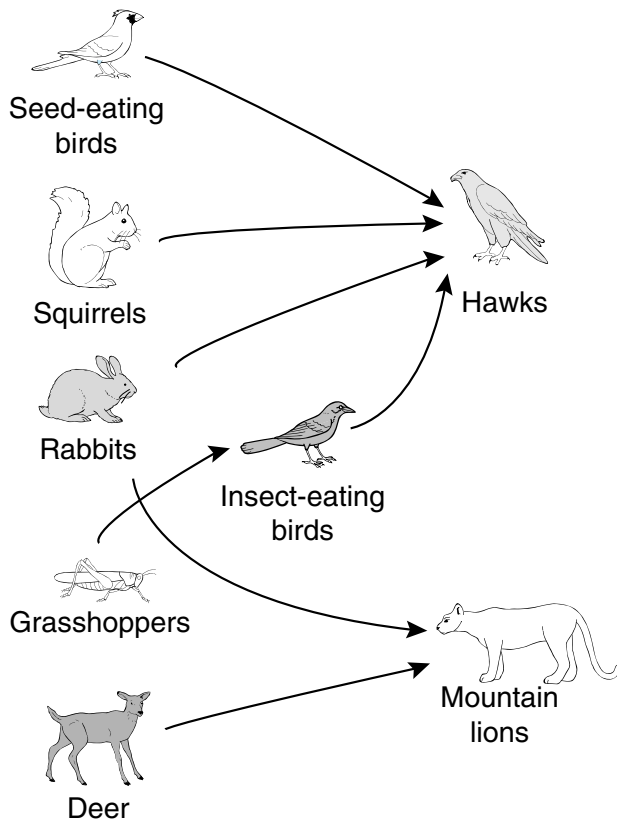
	Plant 1	Plant 2
Type of Plant	Marigold	Marigold
Container	Small clay pot	Small clay pot
Location of Container	Indoors	Indoors
Hours of Sunlight Each Day	8 hours	1 hour
Amount of Water Each Day	5 milliliters	5 milliliters
Temperature	Constant 25°C	Constant 25°C
Starting Height	10 centimeters	10 centimeters
Ending Height	35 centimeters	15 centimeters

A student grew two plants in science class. The student recorded observations in the table above. Based on the student's observations, what is the most likely reason that Plant 1 grew taller than Plant 2?

- A** Plant 1 received more sunlight than Plant 2.
- B** Plant 1 received more fresh air than Plant 2.
- C** Plant 1 had more space to grow than Plant 2.
- D** Plant 1 required less water to grow than Plant 2.

**Answer Key: page 74**

Question 6



This model is an incomplete food web. This drawing could be made more complete by —

- A including producers, such as grasses
- B changing the direction of the arrows
- C including nonliving things, such as rocks
- D connecting each organism to all the other organisms



Answer Key: page 74

Question 7

Which statement is best supported by fossil evidence?

- A The types of animals on Earth have changed over time.
- B Human activities have been the main cause of all extinctions.
- C The environment has remained the same over time.
- D Natural disasters have sometimes destroyed all life on Earth.



Answer Key: page 75

Objective 2

The student will demonstrate an understanding of the life sciences.

From your studies in science, you should be able to show an understanding of the life sciences.

Life science? That's the study of living things, right?

Right! Life science is the study of *organisms*. Organisms are living things, such as plants and animals, including people. In life science we learn how different species meet their needs and how species adapt to their surroundings. A *species* is a group of organisms that have similar traits and can breed with one another. A *population* is a group of organisms that live in the same area and belong to the same species.

Adapt? What does that mean?

Good question. I'll answer it in a minute, but let me explain a few things first. All organisms have traits, or characteristics. For example, some human traits might include having black hair or being left-handed or having freckles.

Many of an organism's traits are *inherited*. Inherited traits are controlled by genes. Because genes are passed from parents to offspring, so are inherited traits.

Now I can answer your question. An *adaptation* is an inherited trait that helps an organism meet its needs. An organism is adapted to an environment when its inherited traits help it survive there. For example, polar bears have very thick coats. This adaptation helps them stay warm in a cold environment.

What are some other adaptations?

Here are just a few types of adaptations.

Purpose of Adaptation	Examples
Getting food	<ul style="list-style-type: none"> Eagles have sharp beaks that they use to tear apart small animals. Female mosquitoes use their straw-like mouthparts to suck blood.
Protection	<ul style="list-style-type: none"> Rosebushes have thorns that help protect them from plant-eating animals. When skunks are threatened, they can spray a bad-smelling liquid onto their enemies.
Reproduction	<ul style="list-style-type: none"> The seeds of coconut palm trees float on water and can be carried from one island to another by the ocean. The shells around bird eggs help protect their young until they are ready to hatch.
Water conservation	<ul style="list-style-type: none"> Lizards have scaly skin that prevents water loss. Some plants have small leaves to prevent water loss.
Getting oxygen	<ul style="list-style-type: none"> Fish have gills that they use to take oxygen from the water in which they live. A dolphin breathes air through a single nostril on top of its head when it comes to the ocean's surface.

So far you've mostly just talked about things that organisms have, like seeds or wings. What about things that organisms do, like drinking or breathing? Are those inherited traits?

Drinking and breathing are types of *behavior*. Behavior is the way an organism acts or what it does. And yes, some types of behavior are inherited. Inherited behavior is sometimes called *instinctive behavior*.

Animals don't have to learn instinctive behaviors. Animals are born knowing how to do them. No one has to teach a spider how to spin a web, and no one has to teach a lizard to lie in the sun to stay warm. These are instinctive behaviors.

Objective 2

My mom knows how to drive a car. Does that mean I inherited this behavior? Maybe I won't have to take a driving class when I get older!

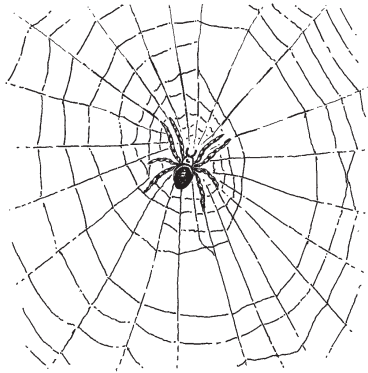
Hold it! Some behaviors are inherited, but many aren't. Driving a car is a learned behavior. You aren't born knowing how to do it, even if both your parents can drive. Someone has to teach you to drive before you can do it.

What about animals? Can they learn things?

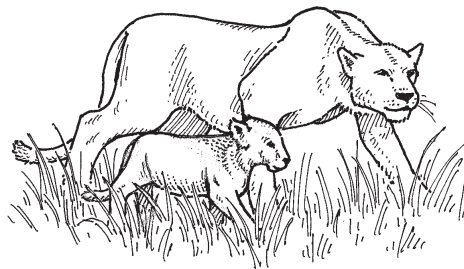
Yes! People aren't the only ones who have learned behaviors. Other animals do, too. A blue jay is a type of bird that eats insects. If a blue jay eats a monarch butterfly, the blue jay will get sick. But young blue jays don't know this. They have to learn it.

How do they learn it? They learn by experience. The first time a young blue jay eats a monarch butterfly, it gets sick and throws up. After that the blue jay knows not to eat any more monarch butterflies.

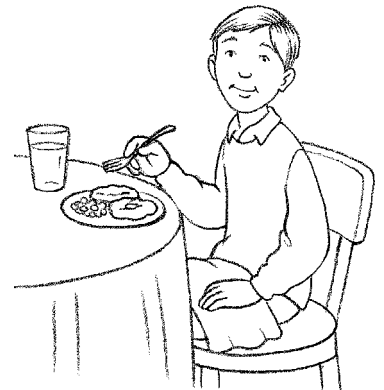
Other behaviors are a mixture of instinctive and learned behaviors. A lion cub is born with the instinct to hunt, but its mother teaches it how and where to hunt.



Web spinning is instinctive behavior.



For a lion cub, hunting is both an instinctive and a learned behavior.

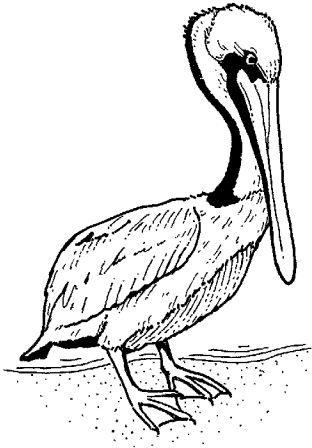


Good manners are learned behaviors.

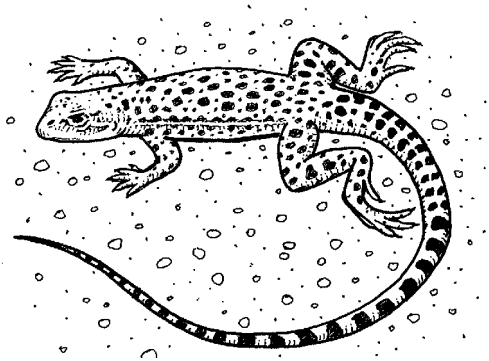
Now I understand more about animal behavior. Can you tell me about the places where animals live?

You bet. The place where an animal or a species lives is called its *habitat*. Dolphins live in the ocean, so the ocean is their habitat. A habitat usually contains all the things a species needs in order to live, such as food, shelter, water, and oxygen.

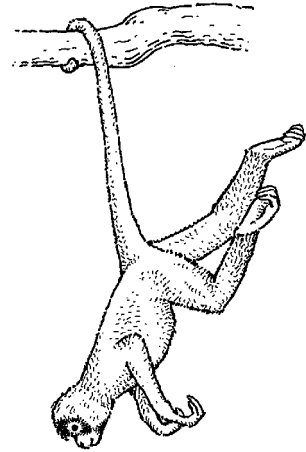
Every living thing has a habitat, even you. Your habitat is the neighborhood where you live, play, and go to school.



This bird is adapted to its habitat beside the water. It scoops fish out of the water with its large bill.



Some lizards live in hot, dry habitats. They have thick, scaly skin that keeps them from drying out.



This monkey has a tail that can grasp tree limbs. The tail is an adaptation that helps the monkey live and climb in trees.

What will happen if an organism or a species isn't adapted to its habitat?

Let me give you an example. Suppose two light-brown jackrabbits have several baby jackrabbits. The jackrabbits live in a dry habitat among sand, rocks, and spots of dry grass.

All the babies are light brown except one that is white. The white rabbit had a difference in its genes that makes its fur color different from that of its parents.

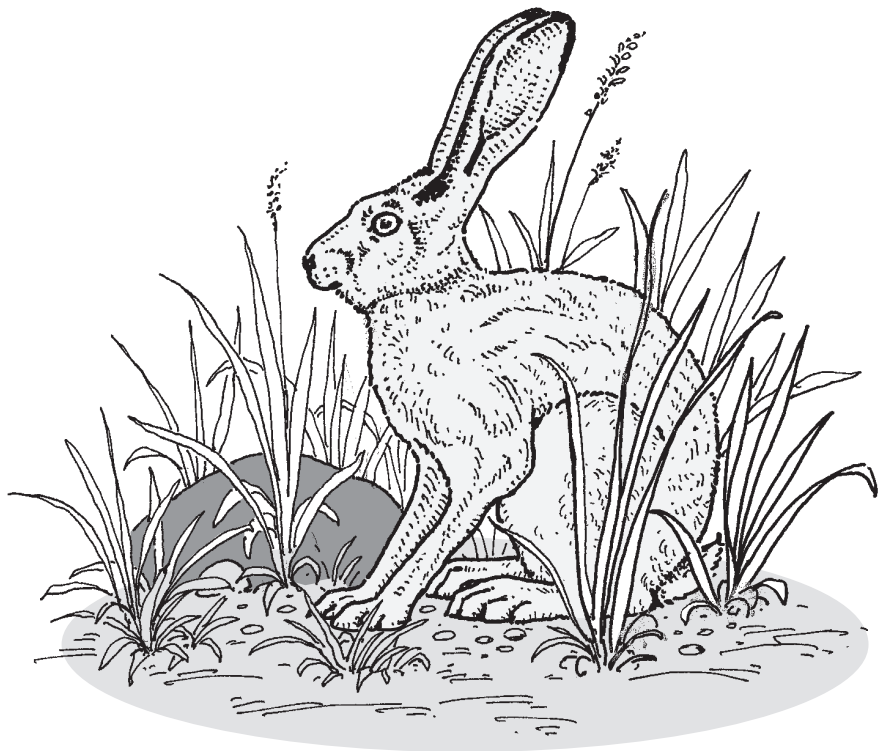
Which of the babies will a fox see best when it hunts for dinner? You guessed it! The white jackrabbit. The baby jackrabbit with white fur is not as well adapted to its habitat as its brothers and sisters. Chances are, the white jackrabbit will not live to pass on its genes for white fur.

Light-brown fur is an adaptation that helps jackrabbits live in a dry habitat. They are able to blend in with their environment because they are about the same color as their surroundings. Their fur color helps protect them from their enemies.

Remember!

If a species isn't well adapted to its habitat, the species could become extinct, or die out.

Jackrabbit



A jackrabbit's light-brown color helps it blend into its surroundings. If jackrabbits were white, they would be more visible to predators and less adapted to their environment.

What about a niche? Is that the same thing as a habitat?

No. An organism's habitat is related to its niche, but it isn't the same thing. Many species can share a habitat. A seashore is a habitat that is home to many kinds of plants, animals, and other organisms.

Only one species can occupy a *niche*. A niche is what a species does in its habitat. A niche describes how the species meets its needs and how it affects other organisms.

Salt Grass Marsh

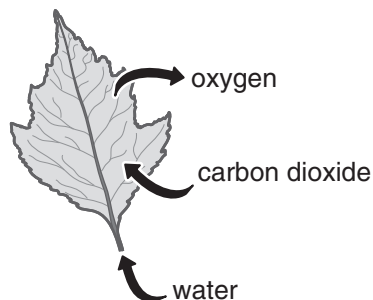
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Salt grass is adapted to living in shallow salty water where the ocean tides come in and out very gently. This type of habitat is called a salt marsh.

Take the niche of a plant such as salt grass. Salt grass provides a home for snails on its leaves. It also provides protection for baby fish and shrimp among its underwater stems. Salt grass makes its own food by using the sun's energy, and it is eaten by snails and other animals in its habitat. When salt grass dies, it becomes food for organisms in the water and adds to the rich soil in the marsh. All the ways salt grass depends on and adds to the marsh is its niche.

You said salt grass makes its own food. How does it do that?

Salt grass is a green plant. All green plants produce sugar by using carbon dioxide gas, water, and energy from the sun. This process, which is called *photosynthesis*, takes place inside a plant's leaves and stems. Green plants are called *producers* because they produce their own food.



Objective 2

But animals don't make their own food. They have to find and eat food, right?

Right! An animal gets food and energy by eating other organisms. A species that eats, or consumes, other organisms is called a *consumer*.

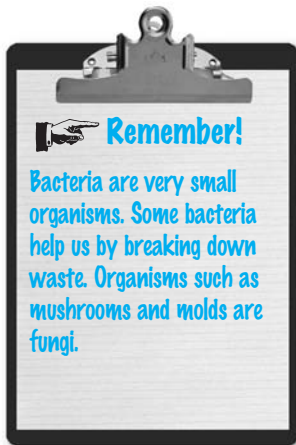
Some consumers eat only plants. These consumers are called *herbivores*. Grasshoppers, rabbits, and cows feed only on plants, so these animals are herbivores.

What about animals that don't eat plants, like lions?

They are consumers, too. But instead of eating plants, lions eat other animals. A consumer that eats other consumers is called a *carnivore*. Other examples of carnivores are rattlesnakes, eagles, and wolves.

I had a salad and a slice of sausage pizza for lunch. I ate part of a plant (the lettuce) and part of an animal (the sausage). What type of consumer does that make me?

That makes you an *omnivore*. An omnivore is a third type of consumer. Omnivores eat both producers and other consumers. Raccoons are another type of omnivore. They eat small animals, such as mice and frogs, as well as fruit and berries. Raccoons can even find a meal in the garbage.



The pizza that I had for lunch also had mushrooms on it. I know that mushrooms aren't plants, and they aren't animals, either. How do they get food?

You're right. Mushrooms are neither plants nor animals. They're fungi. Fungi and some types of bacteria are *decomposers*. Decomposers get their energy by breaking down dead organisms and the wastes of living organisms.

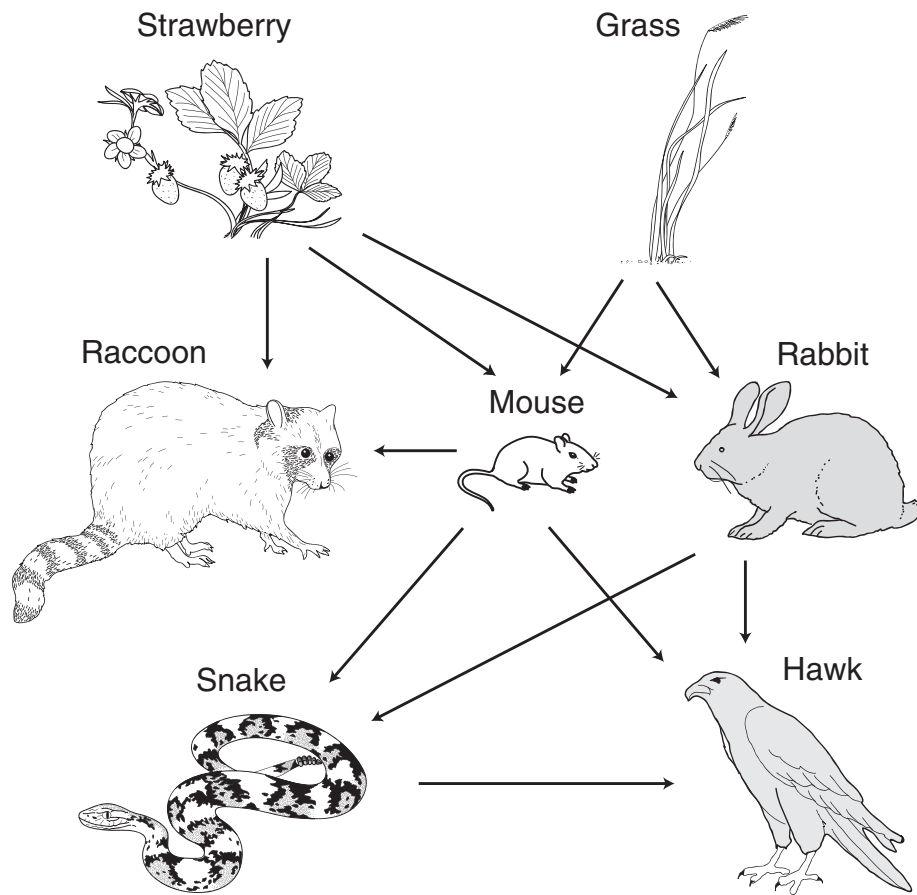
As decomposers break down wastes and dead organisms, they return nutrients to the soil. Plants need these nutrients in order to grow. One of these nutrients is nitrogen. Remind me to tell you more about nitrogen when we talk about cycles.

So we have producers, consumers, and decomposers. Is there a way to keep track of what eats what in an ecosystem?

Yes, there is. It's called a *food web*. A food web is a diagram that shows how energy moves from one organism to another in an *ecosystem*. An ecosystem includes all of the living and nonliving parts of a place and the relationships among these parts.

The arrows in a food web point in the direction that energy moves. In other words, the arrows point from the organism being eaten to the organism that does the eating. To show that snakes eat (or get energy from) mice, you would draw an arrow from the mice to the snakes.

Look at this simple food web.



Arrows show the direction that energy moves through the food web.

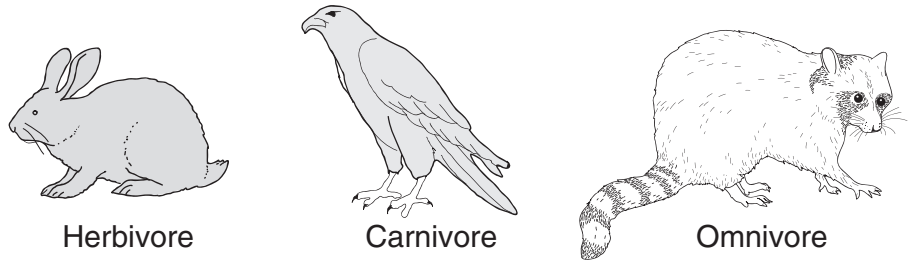
Look at the mouse in the center of the food web. The arrows that point to the mouse show how the mouse gets its energy. The mouse gets energy by eating strawberries and grass seeds.

The arrows that point away from the mouse show the organisms that get energy from the mouse. Raccoons, snakes, and hawks can get energy by eating the mouse.

What are the producers and consumers in this food web?

The producers in this food web are the plants: strawberries and grasses. The producers get their energy from the sun. The rest of the organisms in the food web are consumers. They get their energy by eating other organisms.

Objective 2



Mice and rabbits are herbivores. Snakes and hawks are carnivores.
Raccoons are omnivores.

What if you added decomposers to this food web? Where would they go?

Decomposers break down both plants and animals when they die. Decomposers can get energy from any of the organisms in this food web. If you added decomposers, you would have to draw an arrow pointing from each of the other organisms to the decomposers.

What would happen if all the herbivores were taken out of an ecosystem?

That would leave just omnivores, carnivores, producers, and decomposers. Without herbivores, there would be fewer animals to eat the plants. More plants would have a chance to grow bigger and taller. After a while the plants might run out of room to grow.

Without herbivores, carnivores would have fewer animals to eat. Some carnivores would probably starve. Herbivores are a necessary link in the flow of energy in an ecosystem.

What do you think might happen if the producers were removed from an ecosystem?

Probably nothing else could live there, right?

Right. Producers form the base of any food web. Without producers, energy from the sun would not be able to enter the food web. Herbivores would starve because they wouldn't have plants to eat. And once the herbivores died, carnivores and omnivores would begin to starve as well.

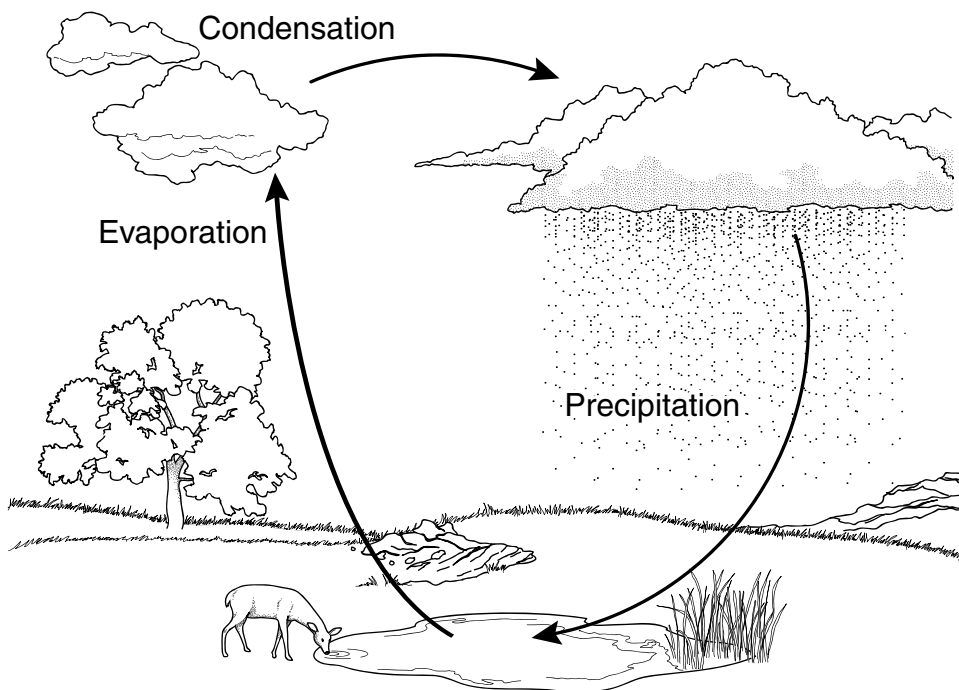
O.K., so I'm a consumer, and I get energy from my food. Is that all I need to stay alive?

No, you need air to breathe, water to drink, and vitamins and minerals from a nutritious diet. Most organisms need other things too.

Wow! So now you're going to tell me that besides a food web, there's a water web and an air web?

You're getting too smart! But we don't call them webs. We call them cycles because water and air are used over and over again. They cycle through the atmosphere, the soil, and living things and then back again. Take water, for example.

The Water Cycle



Animals take in water when they drink and return it to the environment as waste. Plants take in water through their roots. They lose water from their leaves.

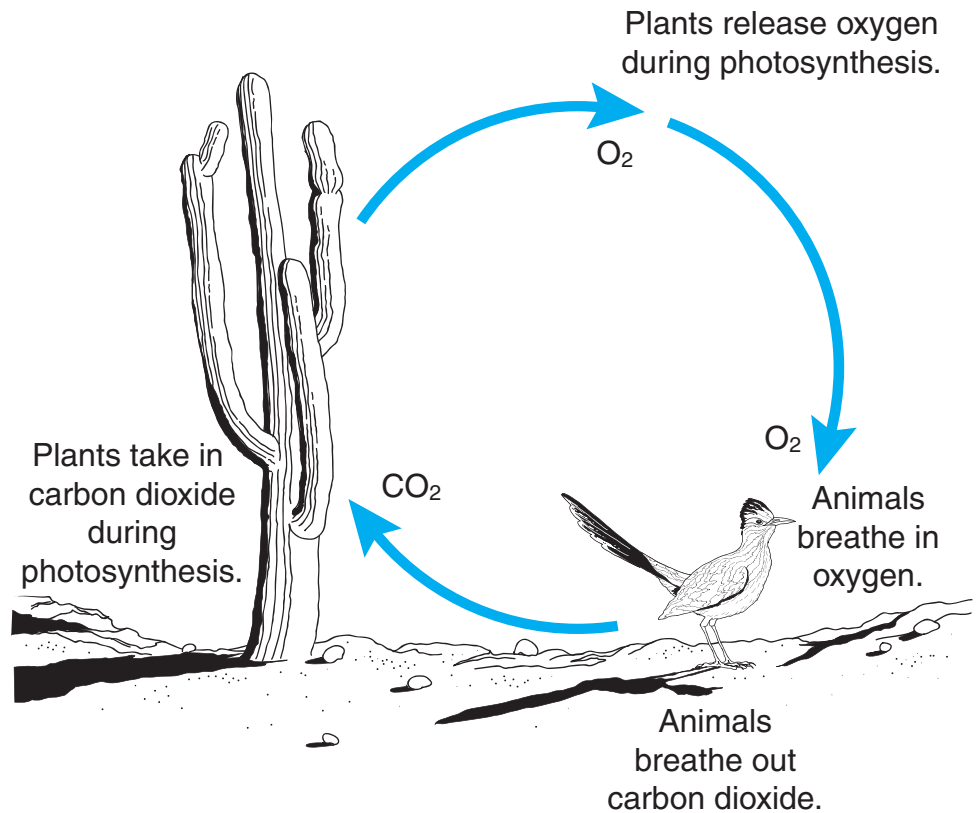
Water at Earth's surface evaporates into the air. Once in the air, water condenses into clouds and then falls back to the ground as precipitation (rain, snow, sleet, hail).

Objective 2

What about air?

Two important gases in air are oxygen and carbon dioxide. These two gases cycle through the ecosystem.

The Carbon Dioxide–Oxygen Cycle

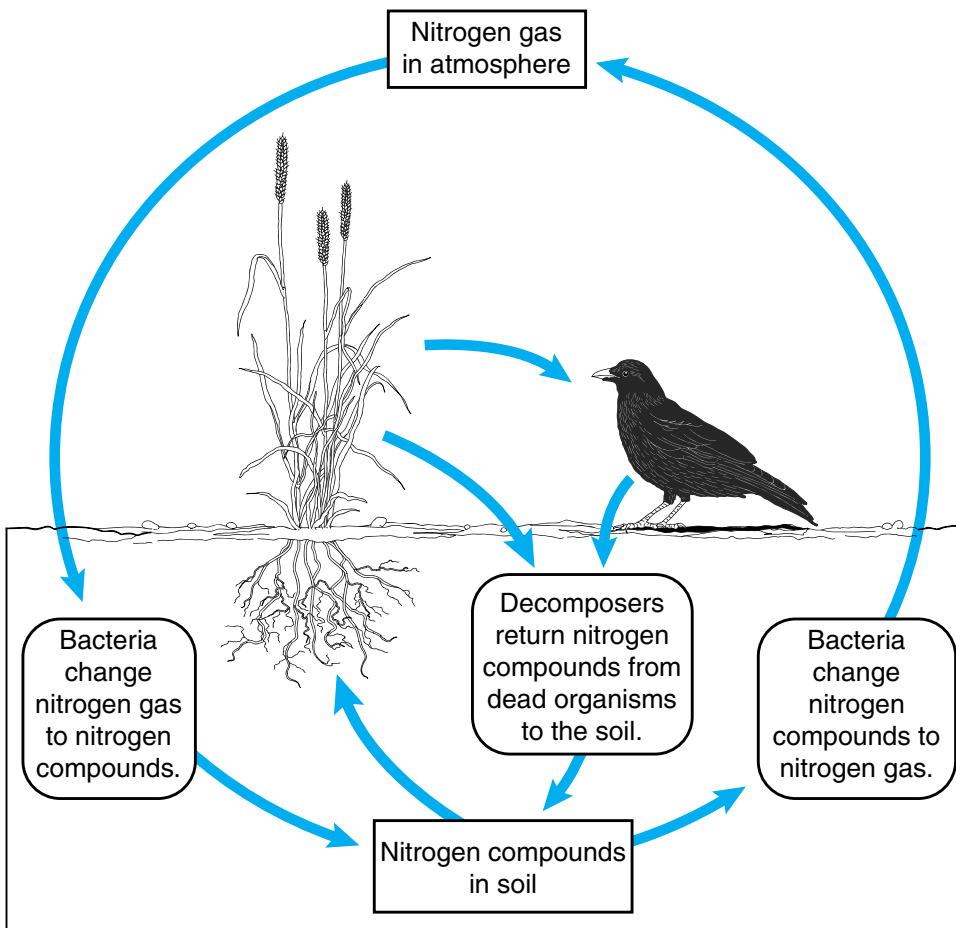


Many animals get the oxygen they need in order to live by breathing air. They breathe out another gas as a waste. This waste gas is called carbon dioxide. But guess what? Green plants need carbon dioxide! They take in carbon dioxide and use it to make food during photosynthesis. Green plants also release oxygen during photosynthesis. In this way both gases are cycled through the atmosphere and through living things. Pretty neat system, huh?

Is that all? Is there another cycle that I should know about?

I'll tell you about one more—the nitrogen cycle. Many of the chemicals in your body contain nitrogen. The proteins in your body, for example, contain nitrogen. Nitrogen is a basic need of every living thing. Nitrogen moves in a cycle, too!

The Nitrogen Cycle



Remember!

Proteins are chemicals that are needed for growth. Proteins make up a large part of your body, such as your muscles and bones.

Air contains lots of nitrogen gas, but most organisms can't use nitrogen in this form. However, there are some types of soil bacteria that can use nitrogen gas. They change nitrogen gas into compounds that plants can use.

Plants take in these nitrogen compounds through their roots. Animals take in nitrogen compounds by eating plants or other animals. When plants and animals die, their nitrogen compounds are returned to the soil by decomposers. Other types of soil bacteria change nitrogen compounds back into nitrogen gas.

See how everything is connected? Every living thing depends in some way on the living and nonliving parts of an ecosystem.

Now try a few practice questions to see what you have learned.



Objective 2

Now It's Your Turn

After you answer the practice questions, you can check your answers to see how you did. If you chose the wrong answer to a question, carefully read the answer explanation to find out why your answer is incorrect. Then read the explanation for the correct answer.

Question 8

A gardener planted a tree seed in a clay pot. As the tree grew, the branches were cut and trimmed to keep the tree small. The tree never grew to be more than 1 meter tall. When the small tree made seeds, the gardener planted some of them in a garden. The new trees grew quickly, and after some time they reached a height of several meters. What is the most likely reason the trees in the garden grew much taller than the tree in the clay pot?

- A** The trees in the garden had a change in their genes that made them grow taller.
- B** The tree in the clay pot had a change in its genes that made it grow less.
- C** All the trees carried genes for smallness, but trees in the garden received more sunlight.
- D** All the trees carried genes for tallness, but the gardener's behavior kept the tree in the clay pot from growing.



Answer Key: page 75

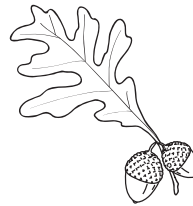
Question 9

Which type of leaf is best adapted for preventing water loss?

A



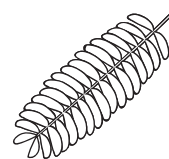
B



C



D



Answer Key: page 75

Question 10

When students drink milk, they become part of a food chain. What is the original energy source of the food chain that includes the students and the milk?

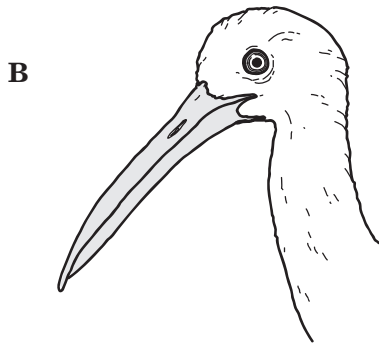
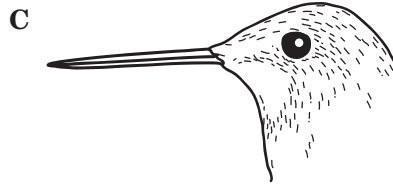
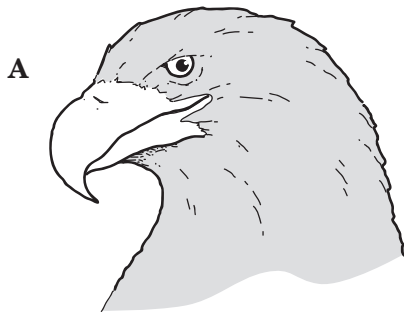
- A Soil
- B Cows
- C Grass
- D Sunlight



Answer Key: page 75

Question 11

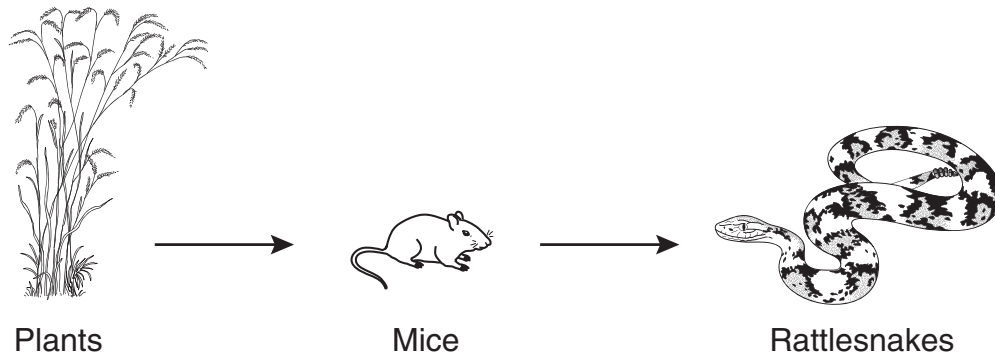
Which bird has a beak that is best adapted for cracking seeds?



Answer Key: page 75

Objective 2

Question 12



If all the mice were removed from this simple food chain, the rattlesnakes would most likely —

- A begin to starve
- B start eating plants
- C become producers
- D increase in number



Answer Key: page 75

Question 13

Organisms	Action in the Ecosystem
Plants	Storing water
Bacteria and fungi	Decomposing dead organisms
Earthworms	Making soil less compact
Bees	Pollinating flowering plants
Nearly all organisms	Cycling oxygen and carbon dioxide

According to the chart, what would most likely happen in an ecosystem if there were a sudden decrease in the number of bacteria and fungi?

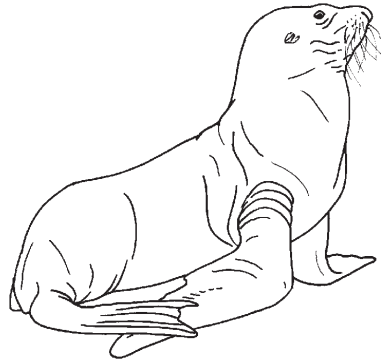
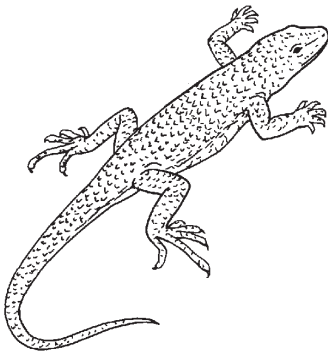
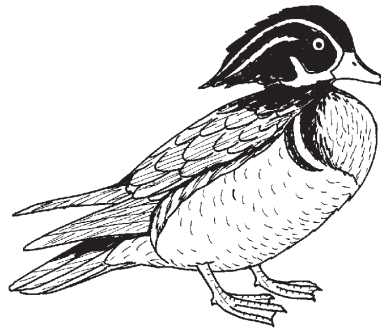
- A The number of plants would increase.
- B The number of bees would increase.
- C The amount of nutrients in the soil would decrease.
- D The amount of water in the air would decrease.



Answer Key: page 76

Question 14

Which animal would most likely be found in a habitat with high temperatures, few plants, and little rainfall?

A**C****B****D****Answer Key: page 76**

Objective 3

The student will demonstrate an understanding of the physical sciences.

From your studies in science, you should be able to show an understanding of the physical sciences.

Physical sciences? Could you tell me what the physical sciences are?

Good question. The physical sciences are the study of *matter* and *energy*.

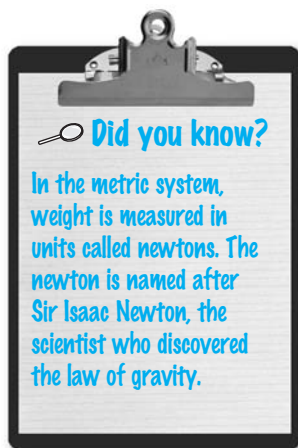
Matter makes up everything you see all around you. A book, a pencil, even your own body—all these are made of matter. Matter is anything that takes up space and has mass.

Matter can move and change. Energy can cause changes in matter. You use energy when you run up stairs. A plant uses energy when it grows taller.

You said that matter has mass. What's mass?

Mass is the amount of matter in an object. An elephant has a larger mass than an ant because an elephant has more matter.

You can use a balance to measure an object's mass. In science, mass is measured in grams or kilograms.

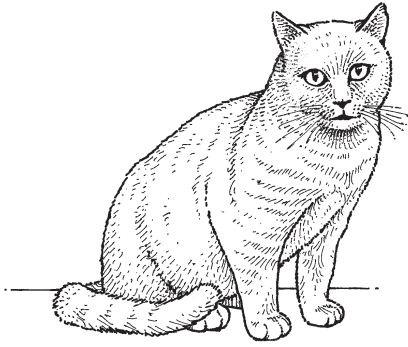


Aren't mass and weight the same thing?

No. Mass and *weight* are related, but they aren't the same. Weight is a measure of the force of gravity on an object. When you step on a scale, you probably measure your weight in pounds. In science, weight is measured in units called *newtons*.

Suppose you travel to the moon. The force of gravity on the moon is much less than it is on Earth, so you would weigh less on the moon than you do on Earth.

Even so, your mass would not change. You would still have as much matter as you did on Earth. You might lose weight by traveling to the moon, but you can't lose mass that way!



Suppose astronauts took this cat to the moon. The cat's mass would not change, but its weight would decrease from 35.3 newtons to 5.8 newtons.

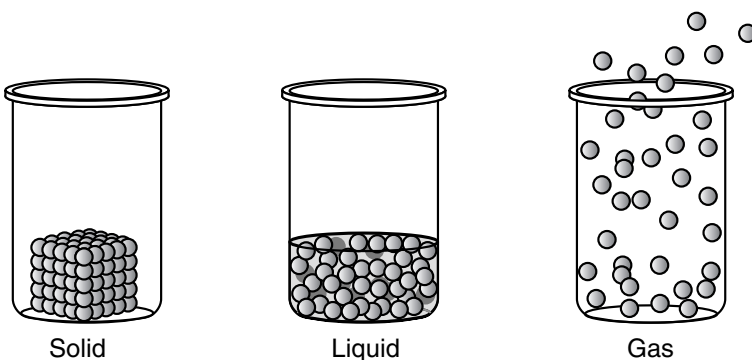
Property	On Earth	On the Moon
Cat's mass	3.6 kilograms	3.6 kilograms
Cat's weight	35.3 newtons	5.8 newtons

Can matter be in different forms?

Yes. Matter has different forms called states. The three states of matter are *solid*, *liquid*, and *gas*.

Have you ever put an ice cube in hot sunlight? You probably observed that the ice melted to water fairly quickly. Ice is water in its solid state. Water changes state when it absorbs or loses energy. When ice absorbs energy, its state changes from a solid to a liquid. If more energy is added to the liquid water, it becomes a gas called steam. If energy is taken away from the steam, liquid water forms. If more energy is taken away, the liquid water becomes ice.

Now think about the last time you saw a pot of water boiling on the stove. Did you notice steam rising into the air? Steam, also known as water vapor, is water in its gas state.



These drawings model the particles that make up a solid, a liquid, and a gas.

The particles of a solid are packed tightly together. A solid does not change shape when you put it into a container. For example, an ice cube keeps the same shape whether you put it in a glass or in a pitcher.

The particles of a liquid can flow past one another. Liquids take on the shape of their containers. When you pour water into a glass, the water

Objective 3

takes on the shape of the glass. When you pour water into a pitcher, the water takes on the shape of the pitcher.

The particles of a gas can move about freely. Gases take on both the shape and the volume of their containers. When you boil water in a pot, steam rises out of the pot and spreads out into the room.

So mass, weight, and state are all properties of matter. Does matter have any other properties?

Yes! There are many properties that scientists use to classify matter. Color, size, shape, smell, taste—all these are properties that can describe matter.

Here are a few more properties of matter that you need to know:

- **Melting point:** The melting point of a substance is the temperature at which the substance changes from a solid to a liquid. Ice changes to a liquid at its melting point of 0°C .
- **Boiling point:** The boiling point of a substance is the temperature at which the substance changes from a liquid to a gas. Water changes to steam at its boiling point of 100°C .
- **Magnetism:** Magnetic substances are attracted to strong magnets. Iron nails are magnetic, but wooden toothpicks are not.
- **Ability to conduct electricity:** Some substances can *conduct*, or carry, electricity better than others. A metal wire is a good conductor of electricity, but the plastic covering around the wire is not. Matter that does not conduct electricity well is called an *insulator*.

What happens when different kinds of matter are mixed?

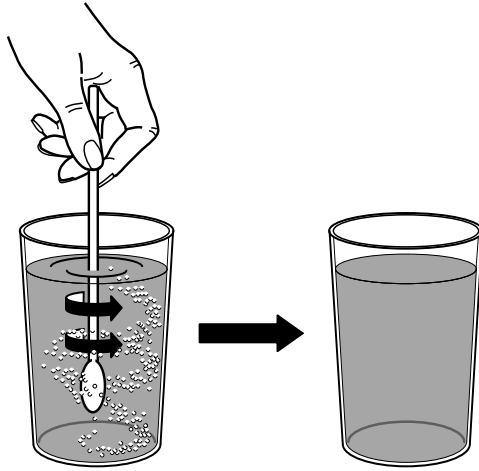
When two or more substances are mixed together but can be physically separated, the result is called a *mixture*. Sometimes the substances mix together so well that it looks as if some of the substances have disappeared. In fact, they haven't disappeared at all! Have you ever stirred sugar into iced tea? Suppose you put a spoonful of sugar into a glass of tea and stir. What happens to the sugar? After a while you can no longer see it. But take one sip of the tea, and you'll know it's sweet. The sugar is still there. It has mixed with the water in the tea to form a *solution*.



A solution is a mixture in which one substance dissolves in another. Because sugar dissolves in tea, the mixture of tea and sugar is a solution.

Let's look at this a little closer. When you stir the tea, the grains of sugar dissolve, or separate, into particles of sugar that are too small to be seen. These sugar particles may be tiny, but they're still sugar. They spread out evenly in the water particles of the tea.

Mixture of Tea and Sugar

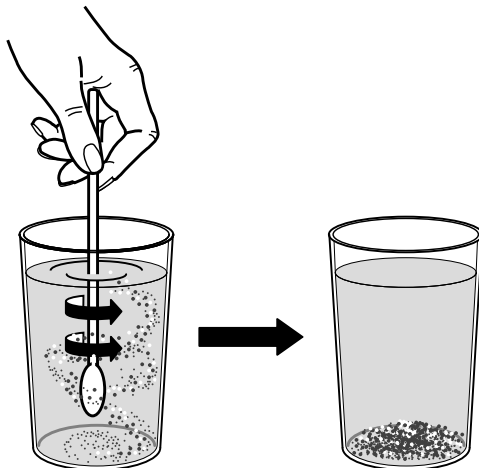


Sugar dissolves in tea to form a solution.

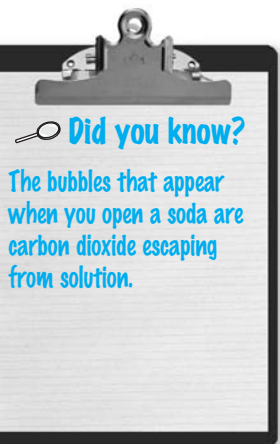
Do all mixtures form solutions?

No. Not all mixtures are solutions. What would happen if you were to mix sand and water? Would the sand dissolve? No, it wouldn't. The grains of sand would remain large enough to see. After a while the sand would settle to the bottom of the water.

Mixture of Sand and Water



Sand does not dissolve in water.



Objective 3

O.K., so you explained matter. What about energy? I'm still not quite sure what energy is. Can you tell me more?

Energy is what makes things happen. You probably already know this from experience. Having a lot of energy makes it easier to do your homework. Homework isn't so easy when you're tired.

You get energy from the food you eat. You use that energy every second of the day, even when you are sleeping. Your body needs energy just to stay alive.

You already have some idea of what energy is. But to scientists energy is the ability to move or change matter.

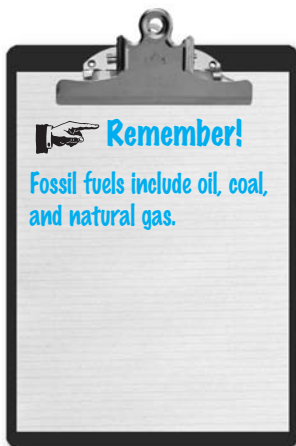
Anything that is moving has energy. Energy can also be stored. Have you ever stretched a spring, held it, and then let it go? As you stretched the spring, you gave it energy. That energy was stored until you let go. Then it turned into energy of motion.

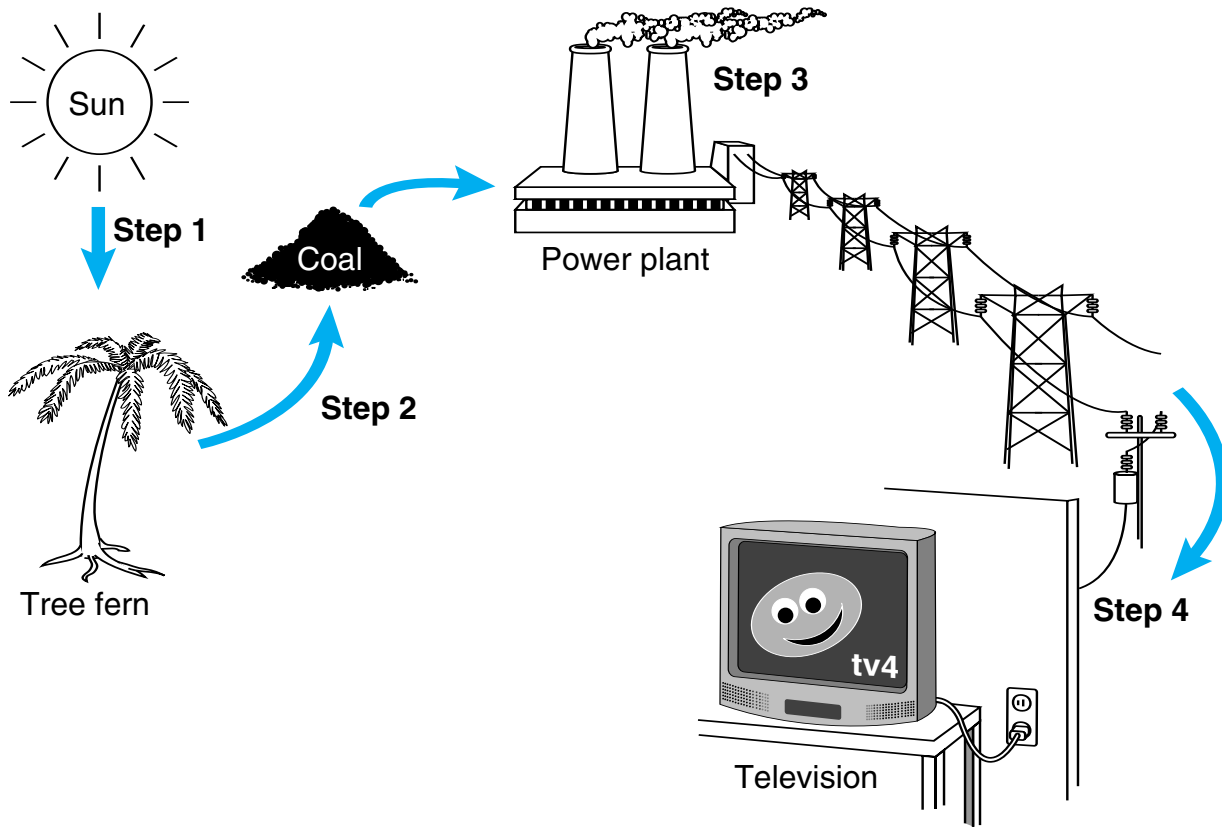
Is energy really that important?

Sure! Without energy from the sun, Earth would be a lifeless planet. There would be no animals, no plants, and no people. What a boring place!

Energy that comes from the sun is called *solar energy*. The sun is the source of almost all our energy. This statement might not seem true. You're probably wondering, "How does the energy used to run a television come from the sun?" Here's one way it can happen:

- **Step 1:** Plants use light energy from the sun to make food and grow.
- **Step 2:** Dead plant material gets buried. Over millions of years, it turns into fossil fuels. Energy from the plants is stored in the fossil fuels.
- **Step 3:** When fossil fuels are burned, they release stored energy as heat energy. Power plants turn that heat energy into electrical energy.
- **Step 4:** Electrical energy moves from power plants to homes. When someone turns on a television, electrical energy is changed to light and sound energy.



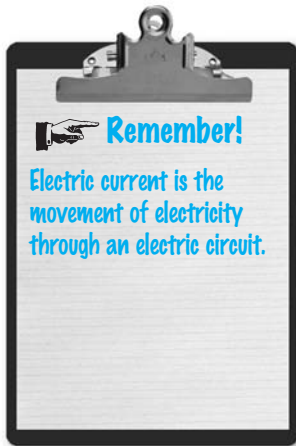


How does electricity move through wires?

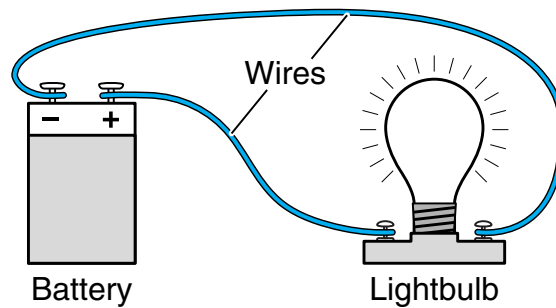
Electricity moves through wires only when the wires are part of an *electric circuit*. A circuit begins and ends at a source of electricity. A battery is a source of electricity in some electric circuits.

A battery has a positive end (+) and a negative end (-). If one end of a wire is connected to the negative end of a battery and the other end of the wire is connected to the battery's positive end, electricity will move through the wire. An electric circuit is the path that electricity takes from one end of the battery to the other.

Objective 3

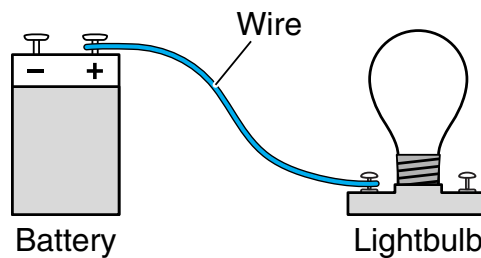


Complete Circuit



This drawing shows a complete circuit. An electric current moves from one end of the battery to the lightbulb and then back to the other end of the battery. Because the circuit is complete, electricity moves through the wires, and the lightbulb lights up.

Incomplete Circuit



This drawing shows an incomplete circuit. Only one pole of the battery is connected to the lightbulb. Electricity does not move through the wire, and the lightbulb does not light up.

When you plug a television into a wall, you complete an electric circuit. The wall outlet is the source of electricity for this circuit. Electric current travels from the outlet, through the wires in the television's cord, to the television, and back again.

O.K., now I understand a bit about electrical energy. What about sound energy?

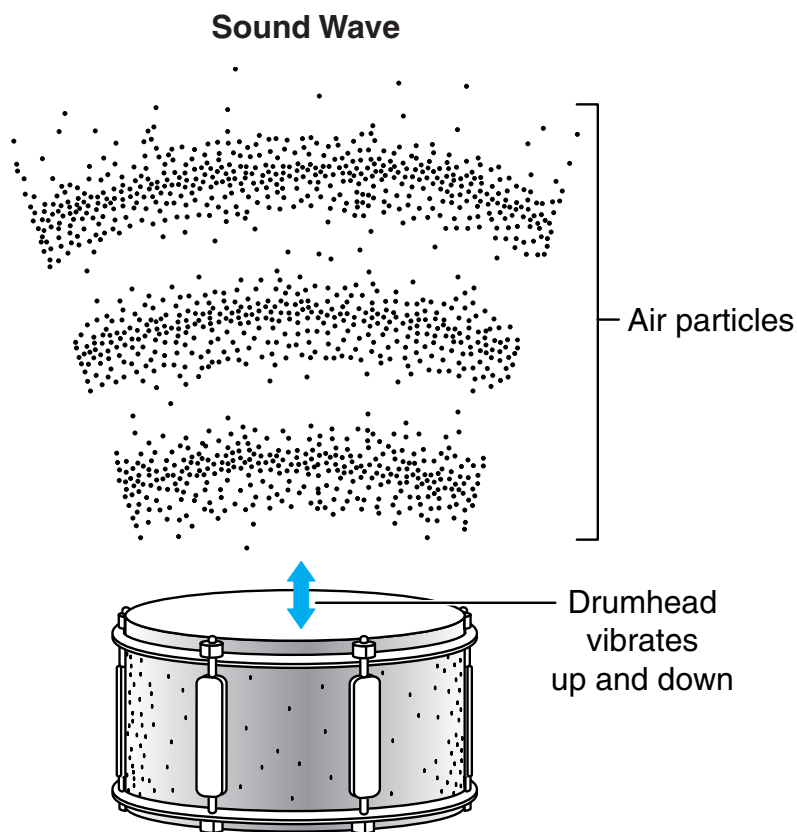
Every sound begins as motion. When you speak, your vocal cords move. When you play a guitar, the strings move. When you hit a drum, the drumhead moves.

Each of these movements is a back-and-forth motion. This type of motion is called a *vibration*. Every sound comes from a vibrating object.

But how does a vibration turn into sound?

Let's look at a vibrating drumhead. When you strike a drum, the drumhead moves up and down. Each time it moves up, it pushes nearby air particles closer together.

As the drumhead continues to move up and down, it makes a pattern in the air that spreads out in all directions. In some places the air particles are closer together. In other places they are farther apart. This is a sound wave!



A vibrating drumhead produces a sound wave in the air.

What? Are you saying that sounds are just air?

Well, in a way. When these patterns in the air strike your ear, your brain recognizes them as sound. Different patterns make different sounds. Some are loud, and others are soft. Some are pleasing, and others are just annoying. But they are all caused by vibrations.

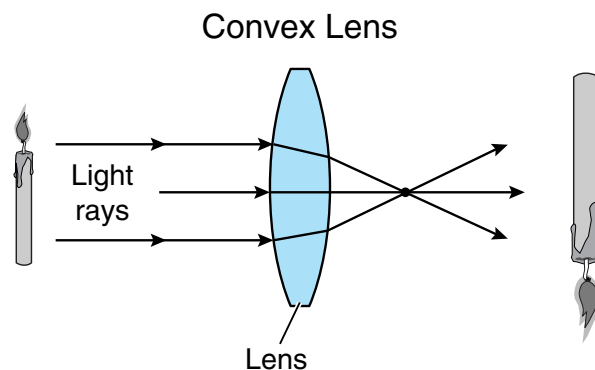
Can you tell me more about light energy?

Of course! Light energy travels in waves much like sound energy does. Light waves can travel through certain types of matter, such as air, glass, and water. They can even travel through space.

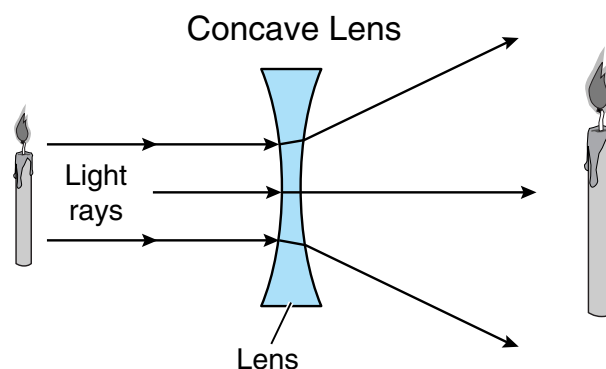
When light passes from one type of matter to another at an angle, the light bends. This bending of light is called *refraction*.

So light waves can bend?

Yes, you can see because your eyes are able to bend light rays with a lens. A lens is a curved piece of glass or other material that is used to refract light. The front of your eye is a lens. It focuses light rays on the back of the eye. The back of the eye is called the retina.



A lens that is thicker in the middle than at the edges bends light rays toward one another. This is the type of lens found in your eye and in a telescope.

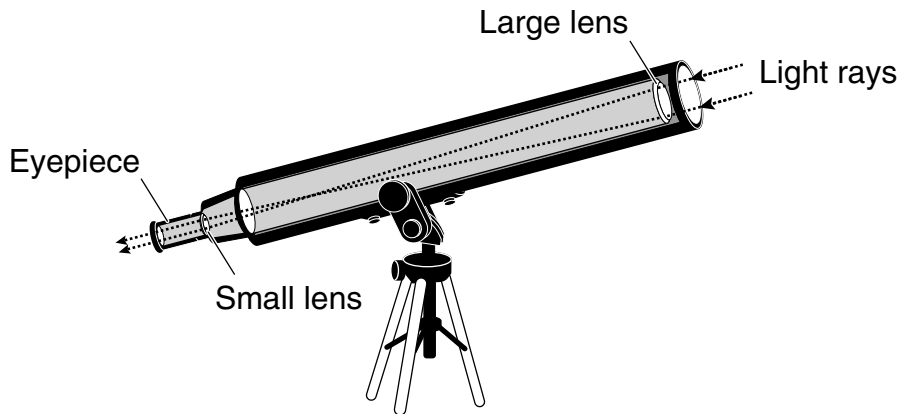


A lens that is thicker at the edges than in the middle bends light rays away from one another.

How about telescopes? Do they use lenses?

Yes! A refracting telescope uses lenses to focus light from faraway objects. There is a second but smaller lens in the eyepiece of the telescope. The eyepiece lens makes the image appear larger so that you can see it clearly.

Refracting Telescope



Remember!

To focus light rays means to bring them together at one point.

We've talked about matter and different types of energy. Is there anything else I need to know about the physical sciences?

You've seen what matter is. You've also seen how energy can move or change matter. So what's left? Forces! Forces are what set matter in motion. For example, a child standing on a skateboard at the top of a hill has stored energy. All that's needed to set the skateboard in motion is a push. Well, that push is a force!

Remember!

Any push or pull is a force.

Objective 3

Here are some examples of how forces can cause motion:

- Pulling a cart
- Kicking a soccer ball
- Pushing a book across a desk

Forces can stop motion, too. They can also change the direction of a moving object. For instance:

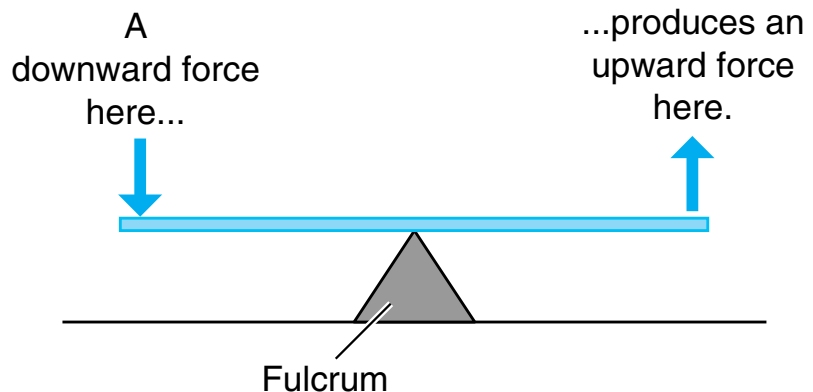
- When you catch a baseball, you are using force to stop the ball's motion.
- When you hit a volleyball with your hand, you are using force to change the ball's direction.

Why should I bother learning about forces?

Well, if you understand how forces work, you can use them to make work easier. Suppose you wanted to lift a large rock. You could use a lever like the one shown below to make this work easier.

When you push down on one end of the lever, the other end goes up. The fixed point that the lever rests on is called the fulcrum. You've probably seen a lever at school. What was it? A balance, of course!

Lever



Now try a few practice questions to see what you have learned.



Now It's Your Turn

After you answer the practice questions, you can check your answers to see how you did. If you chose the wrong answer to a question, carefully read the answer explanation to find out why your answer is incorrect. Then read the explanation for the correct answer.

Question 15

A student set a glass of water next to an open textbook. When she looked through the glass, the student noticed that the writing in the book looked much bigger. This happened because light from the room was reflected off the textbook and was —

- A reflected off the glass
- B refracted by the water
- C absorbed by the water
- D sped up by the glass



Answer Key: page 76

Question 16

One difference between an electromagnet and a bar magnet is that the magnetic field produced by an electromagnet can —

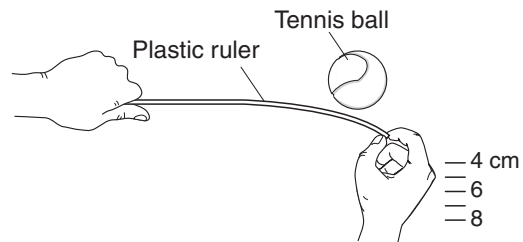
- A be turned on and off
- B attract materials such as wood
- C be made permanent
- D have two north poles



Answer Key: page 76

Question 17

Several students investigated how force affects the distance a tennis ball will travel. The students used the setup below and applied a force to the tennis ball by pulling the ruler back a certain distance.



Distance Ruler Pulled Back (cm)	Distance Tennis Ball Traveled (m)
4	4
5	10
6	18
7	28
8	?

Based on the students' data table, what distance would the tennis ball be expected to travel when the ruler is pulled back 8 centimeters? Record and bubble in your answer to the nearest centimeter on the answer document.

			.
0	0	0	
1	1	1	
2	2	2	
3	3	3	
4	4	4	
5	5	5	
6	6	6	
7	7	7	
8	8	8	
9	9	9	

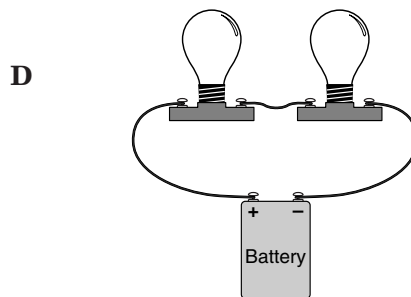
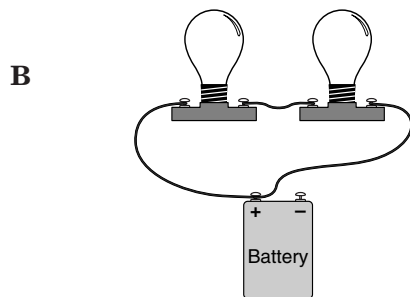
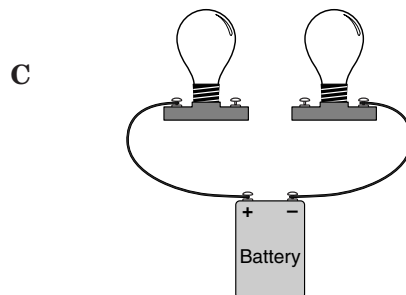
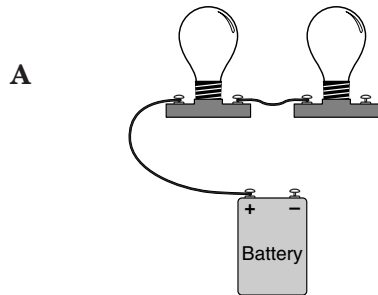


Answer Key: page 76

Objective 3

Question 18

Which picture shows a circuit that will light the lightbulbs?



Answer Key: page 76

Question 19

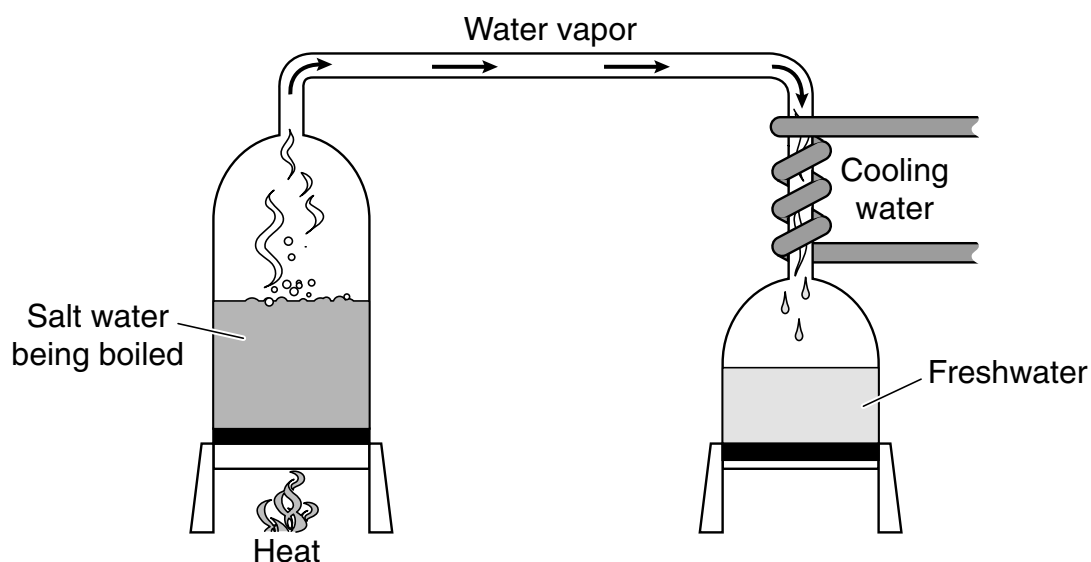
Unlike battery-powered calculators, solar calculators are powered by solar cells. Which of these energy changes is used to power a solar calculator?

- A** Heat energy changing to chemical energy
- B** Light energy changing to chemical energy
- C** Light energy changing to electrical energy
- D** Chemical energy changing to electrical energy



Answer Key: page 77

Question 20

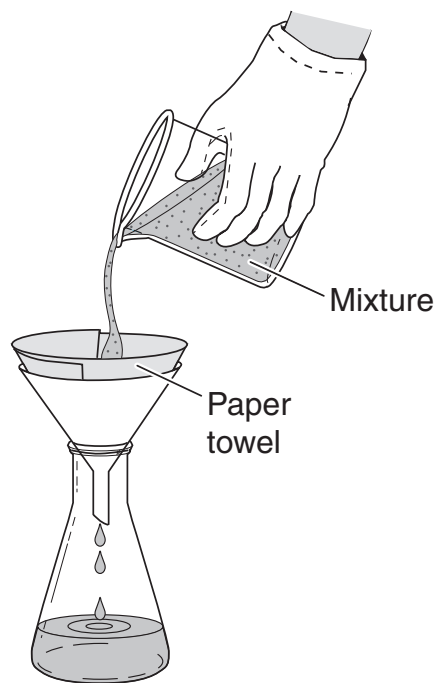


This experiment shows how salt water can be boiled and made into freshwater. Which statement about solutions is supported by the diagram?

- A The parts of a solution must have the same boiling point.
- B A solution is made up of only one type of particle.
- C A solution is formed when a liquid changes into a solid.
- D The parts of a solution can be separated by a physical change.



Answer Key: page 77

Question 21

A student stirs together a mixture of hot water and small amounts of salt, sand, and sugar. The student then pours the mixture through a paper towel. Which substance or substances will collect on the paper towel?

- A** Only the sugar
- B** Only the sand
- C** Both the salt and the sugar
- D** Both the salt and the sand



Answer Key: page 77

Objective 4

The student will demonstrate an understanding of the earth sciences.

You should be able to show your understanding of Earth's physical features, how they are shaped, and why they change.

All right, but what's a physical feature?

I'm glad you asked! Earth's physical features include the many *landforms* found on our planet's surface. These can include:

- mountains
- valleys
- rivers
- canyons
- islands
- beaches
- volcanoes
- oceans
- glaciers

I never thought of a beach as a physical feature. While I was at the beach in Galveston, I built a sand castle. Several hours later, it washed away. What happened?

You're talking about the tides. Tides are the regular rise and fall of the ocean's surface each day. You built your sand castle during a low tide. After you built it, the sea level rose. Your sand castle washed away during a high tide.

But what causes tides?

Tides are caused mainly by the moon's gravity pulling on Earth. Ocean water is pulled toward those areas of Earth closest to the moon.

As long as we're talking about the moon, can you explain what makes the moon glow?

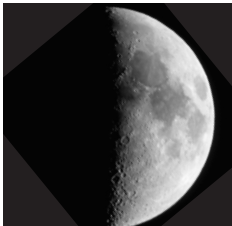
Of course. The moon, like Earth, doesn't produce any light of its own. Moonlight is actually light from the sun that is reflected by the moon's surface back to Earth. At any given time half the moon's surface is lit up by the sun. However, most of the time we can see only part of the surface that the sun shines on.



Objective 4



New moon



©Roger Ressmeyer/Corbis

First-quarter moon



©Bill Ross/Corbis

Full moon



©Photodisc

Third-quarter moon

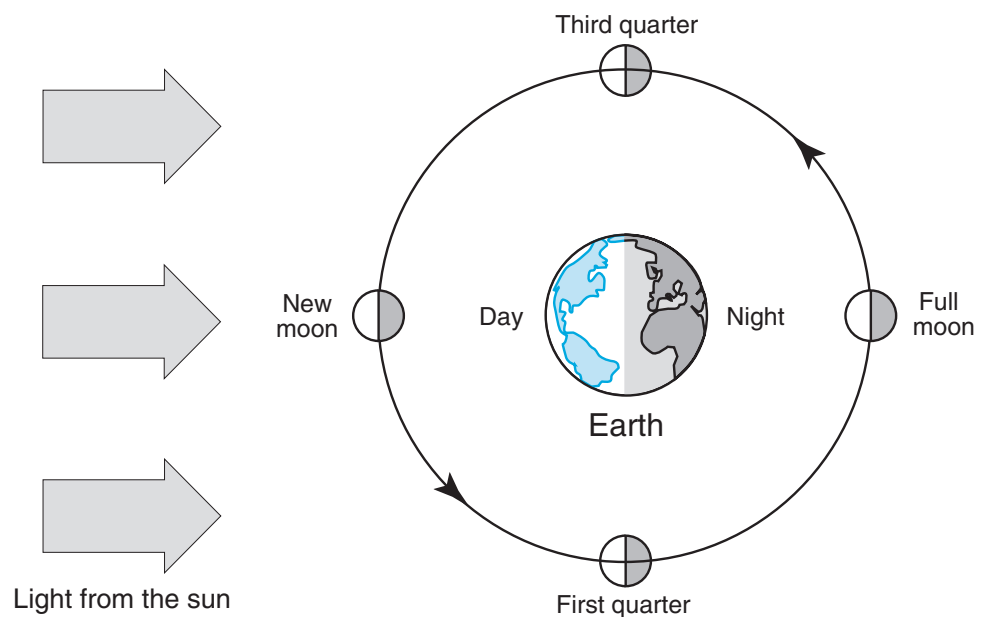


Is this why the moon looks different at different times of the month?

Exactly! You're talking about moon phases. It takes the moon about 29.5 days to go through a complete cycle of its phases as it revolves around Earth. Let me explain the phases.

- **New moon:** When the moon's orbit takes it directly between the sun and Earth, the side of the moon facing Earth is dark, and the side facing the sun is lit up. We can't see the moon during the new-moon phase.
- **First-quarter moon:** As the moon continues to revolve around Earth, the moon's surface becomes visible as a thin crescent. Each night more of the moon's surface is visible to a person on Earth. After the moon moves a quarter of its orbit around Earth, we see half of the lighted half of the moon, or about one-quarter of the moon's surface. A first-quarter moon looks like the right half of a circle.
- **Full moon:** After the first-quarter phase, the surface of the moon that can be seen from Earth continues to increase in size. When the moon reaches the opposite side of Earth from the sun, the entire side of the moon facing Earth reflects sunlight back to Earth. The full moon appears as a complete circle.
- **Third-quarter moon:** After a full moon less and less of the moon's surface is visible each night. After the moon has completed three-quarters of its orbit around Earth, we again see half the lighted half of the moon. A third-quarter moon looks like the left half of a circle. After the third-quarter phase, the surface of the moon that can be seen from Earth continues to decrease in size until the next new moon.

Moon Phases

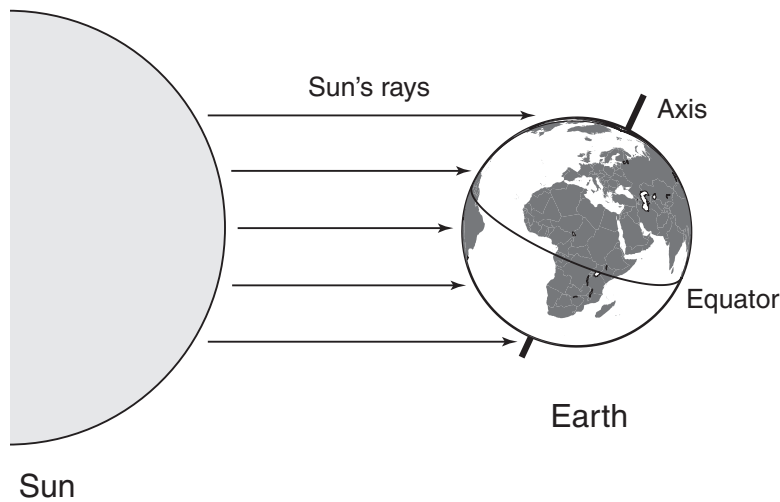


I heard that there isn't any wind on the moon. It was really windy in Galveston. Where does the wind on Earth come from?

That's an excellent question. You're right, there isn't any wind on the moon because there isn't an atmosphere on the moon. Wind is simply air moving across Earth's surface. There are a number of things that cause wind, but the main one is the uneven heating of Earth's surface.

I thought Earth was heated by the sun; how could that be uneven?

Remember Earth is tilted on its axis. The sun's rays strike Earth more directly at the equator than they do at the poles. This causes the air at the equator to warm faster than at other places on Earth.



And this causes wind?

Yes, when air is warmed, the particles gain energy, begin to move faster, and then spread farther apart. This means that warm air is less *dense* than cold air, and the warm air rises. The cold air sinks, replacing the warm air. As the warm air rises, it cools, becomes denser, and then sinks back to Earth's surface, where it warms again. Wind results because this warming and cooling cycle is happening at different rates on Earth.

What else does uneven heating affect?

It affects climate. It's always cold at the poles, and it's always warm near the equator. Areas close to the equator are warmer because the rays they get from the sun are more direct. But many things affect climate besides distance from the equator.

Large bodies of water affect climate. Water takes a long time to heat up. It also takes a long time to cool down. But land heats up and cools down very quickly. Winds blowing over water onto nearby land keep the temperature of the land more constant. This air is also more humid because it contains more water vapor.



Remember!

Air is made up of particles of different gases, such as nitrogen, oxygen, and carbon dioxide.



Remember!

A substance that is less dense will float on a substance that is more dense.



Remember!

Water in the form of a gas is called water vapor. Humid air contains a lot of water vapor.

Objective 4

Did you know?

Fossils of seashells found in the Texas Hill Country show that the climate in Texas was very different millions of years ago.

Remember!

A fossil is the remains or trace of a living organism from the past. A shell impression pressed into rock is one example of a fossil.

O.K. But why do I really need to know this? What good does it do for me to know how things on Earth work?

I love this question! Understanding science and how things work gives you the skills to be a great science detective. If you understand how things work on Earth, you can figure out what things were like on Earth long before you were born. Knowing the past is helpful in predicting the future. This is important because Earth's surface is always changing.

Really? What causes these changes?

Earth's surface can be changed by many things, such as wind, rain, and volcanoes. Some of these can change Earth very slowly, and others change it very quickly. For example, wind and rain can wear down a mountain over millions of years. A volcano can change an area within a few hours or a few days. When the Mount St. Helens volcano erupted, it blew away the side of the mountain.

Let me give you an example of how water can change Earth's surface over a long time. A river might run over a flat plain. Over time the water will pick up some of the soil and carry it with the water. The process of moving soil from one place to another is called *erosion*. The force of the water will also wear down large rocks into smaller rocks. The process of breaking rock into soil, sand, and other tiny pieces is called *weathering*. Further downstream the river water will drop some of the soil and rock material at a new location. The areas where this happens are often very sandy or muddy. The process of dropping, or depositing, sediment at a new location is called *deposition*.

Before



After

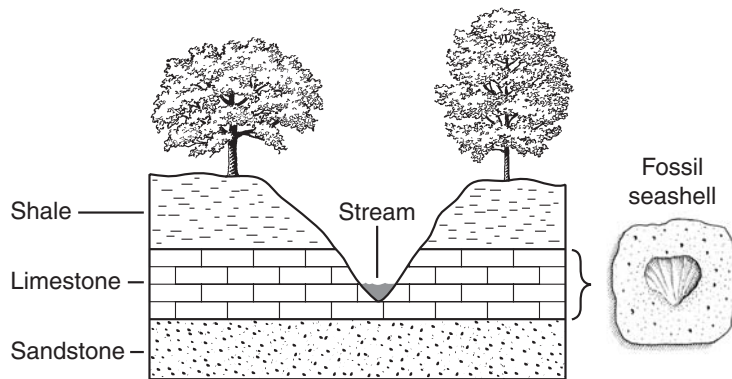


Courtesy of USGS, David A. Johnston, Cascade Volcano Observatory, Vancouver, Washington

On May 18, 1980, Mount St. Helens exploded. Almost one cubic kilometer of rock and volcanic ash was thrown into the air.

How else can scientists learn about the past?

Let me give you another example. We can learn more about Earth's past by studying rocks. Look at the picture on the next page. It shows a valley and several layers of sedimentary rock.



Scientists know that the sandstone is older than the limestone and that the limestone is older than the shale.

How do they know this?

It's like making a peanut butter and jelly sandwich. First you lay a piece of bread on a table. This is the first layer. Next you spread on the jelly. This is the second layer. You can add more items to your sandwich. Each item you add is a layer. It works the same way with layers of sedimentary rock. The layer at the bottom is the oldest layer. This layer was formed first. Over time other layers are deposited onto the first layer. The youngest layer is usually at the top.



Remember!

- Weathering means breaking down rocks.
- Erosion means carrying sediments to another location.

What else can scientists learn from the rock layers?

Well, scientists discovered that fossils of animals found in limestone rock layers are much like the animals that live in the ocean today. For this reason, scientists think that a shallow sea once covered this area. Fossils can also be used to match rock layers from different areas and to understand past changes in climate.

Scientists also think that the stream eroded the shale and limestone to form the valley. Scientists know that the valley and stream are younger than the rock layers.

Is this because the valley is on top of the shale?

Not exactly. Let's go back to the sandwich example. You have to finish making a sandwich before you can cut it into pieces to eat. Right? The valley cuts through the shale and limestone layers, kind of like a knife cutting through a sandwich. The valley must be younger because it cuts across the rock layers, which were there first.

By making careful observations and studying clues like fossils, scientists can figure out what happened on Earth a long time ago.

Objective 4

My teacher said that sand is a natural resource that is used to make glass. Are natural resources the materials in nature that people use to make the things they need?

I think you understand natural resources! Did you know that there are three kinds of natural resources?

- **Renewable resources** are those that can be replaced in a short amount of time. Animals, plants, and freshwater are examples of renewable resources. Animals can give birth to new animals. New plants can grow from seeds. Rain brings freshwater to lakes and rivers.
- **Nonrenewable resources** are those that cannot be replaced in a short amount of time. Oil, natural gas, and coal are examples of nonrenewable resources. It took millions of years for fossil fuels to form. People will use them up before they can be replaced by nature.
- **Inexhaustible resources** are those that people cannot use up. Energy from sunlight is an example of an inexhaustible resource.

Renewable Resources	Nonrenewable Resources	Inexhaustible Resources
Plants Animals Water Oxygen Soil	Oil Natural Gas Coal Minerals	Wind Sunlight Ocean tides

I don't use very many resources, so I don't worry about them.

Really? I think you'd be surprised at how many resources you use each day. Every time you eat, you are using plants, animals, or both. Many homes are built with wood. Wood comes from trees. Do you know where the paper that this is written on came from? How about your pencil? That's right. Trees again!

Now try a few practice questions to see what you have learned.



But I'm using a pen, not a pencil. It's made of plastic!

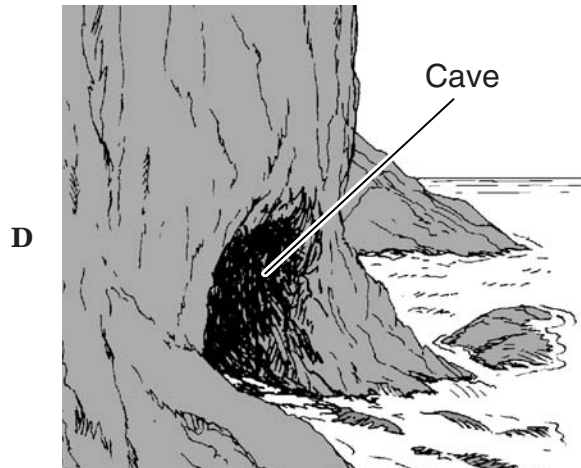
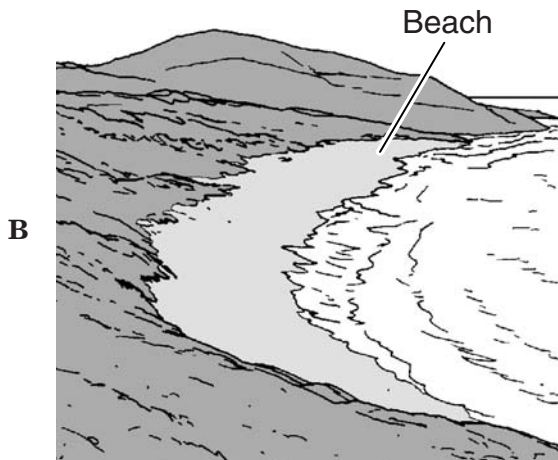
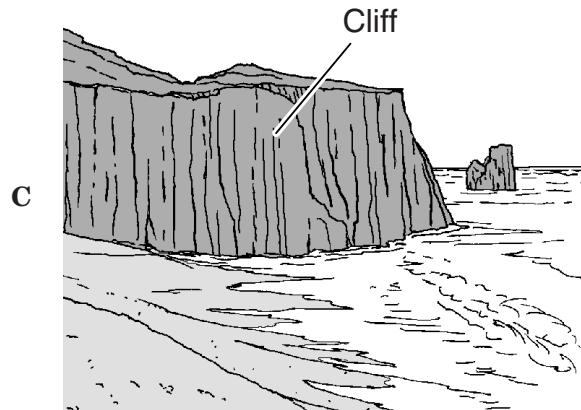
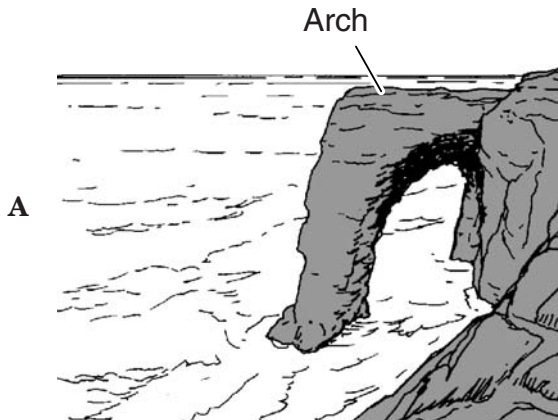
Plastics are made from oil, a nonrenewable resource. Even some clothes are made from materials that come from oil. Clothes can also be made of cotton, which is a plant. The lights in your school run on electricity. A power plant supplies the electricity, and it probably uses a fossil fuel to make it. I could go on and on, but I think you get the picture. Every time you use energy, eat something, or buy something, you are using natural resources.

Now It's Your Turn

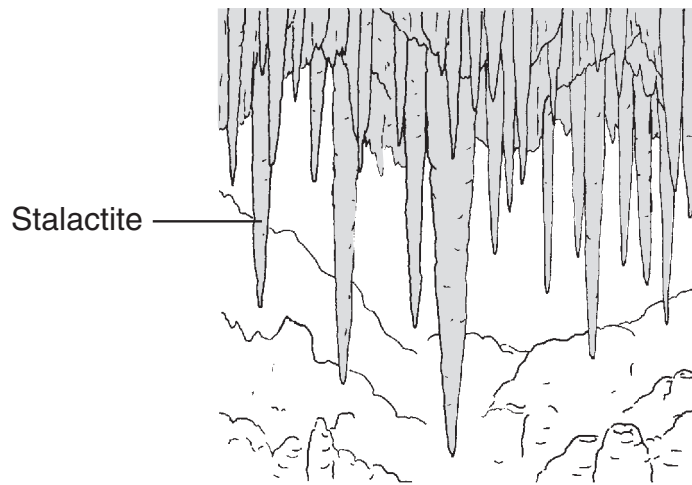
After you answer the practice questions, you can check your answers to see how you did. If you chose the wrong answer to a question, carefully read the answer explanation to find out why your answer is incorrect. Then read the explanation for the correct answer.

Question 22

Which landform was most likely made by the process of depositing sediments?



Answer Key: page 77

Question 23

A stalactite is a feature that hangs like an icicle from the roof of a cavern. How do stalactites in limestone caverns most likely form?

- A** Glaciers move through the cavern and deposit weathered limestone.
- B** Wind flows through cracks in the roof and erodes some of the limestone.
- C** An underground river flows through the cavern and dissolves some of the limestone.
- D** Groundwater drips through cracks in the roof and deposits limestone over time.



Answer Key: page 77

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Question 24

A student placed some clean rocks in a clear plastic jar. The jar was filled with clean water and covered with a lid. Then the student shook the jar for five minutes. The student noted that smaller pieces had broken off some of the rocks and that there was a fine grit on the bottom of the jar.

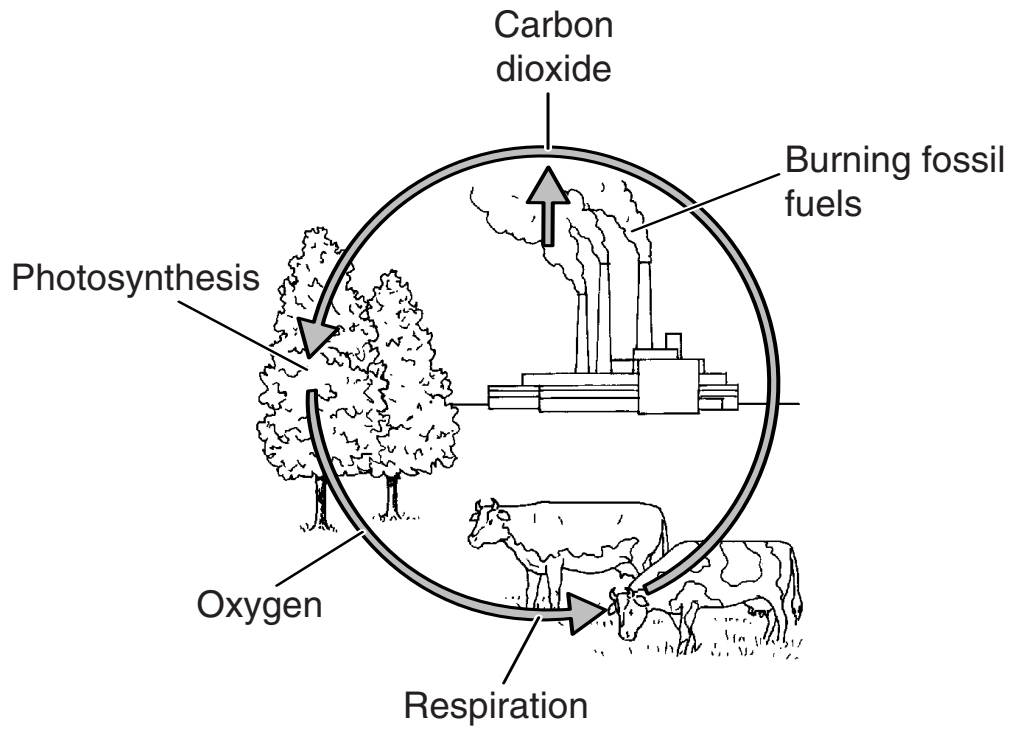
Which change of Earth's surface was the student modeling?

- A** Physical weathering
- B** Chemical weathering
- C** Erosion of sediments
- D** Forming deltas



Answer Key: page 77

Question 25



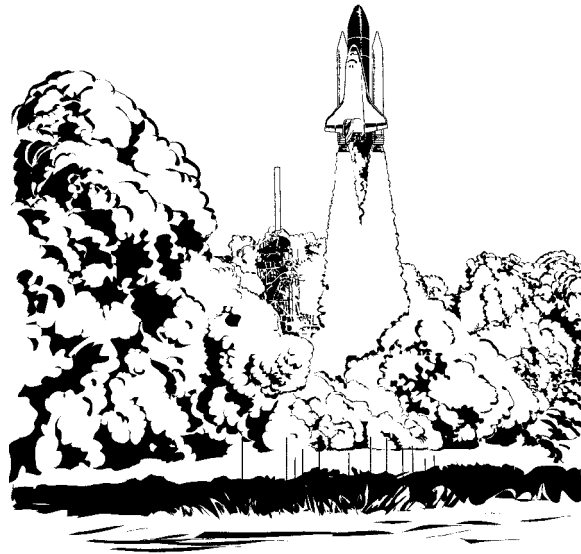
An increase in the average level of carbon dioxide in the atmosphere is most likely caused by an increase in the —

- A extinctions of animals
- B plant life on Earth
- C number of large forest fires
- D number of solar-powered homes



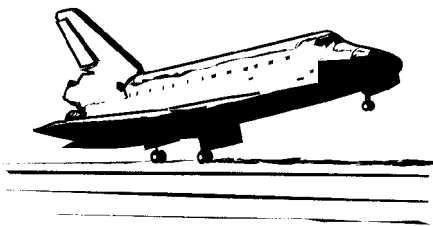
Answer Key: page 78

Question 26

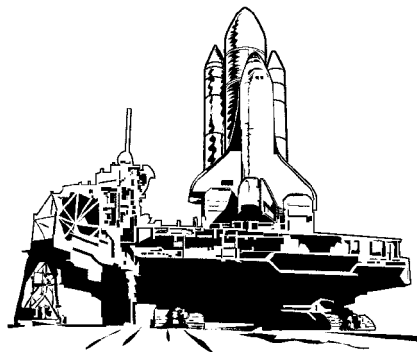


Which of the pictures below shows what happened just before the shuttle in this picture took off?

A



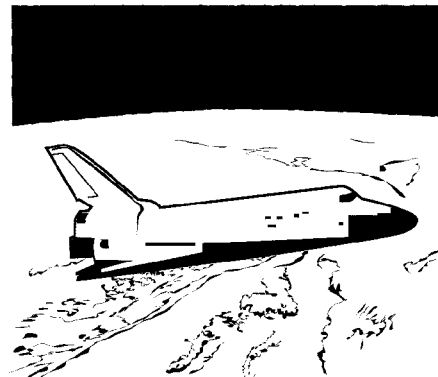
C



B



D



Answer Key: page 78

Question 27

Which of these is an inexhaustible resource?

- A Coal
- B Gold
- C Trees
- D Wind



Answer Key: page 78

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Question 28

A sudden change in wind direction, air temperature, and cloud cover most likely signals a change in —

- A climate
- B landforms
- C seasons
- D weather

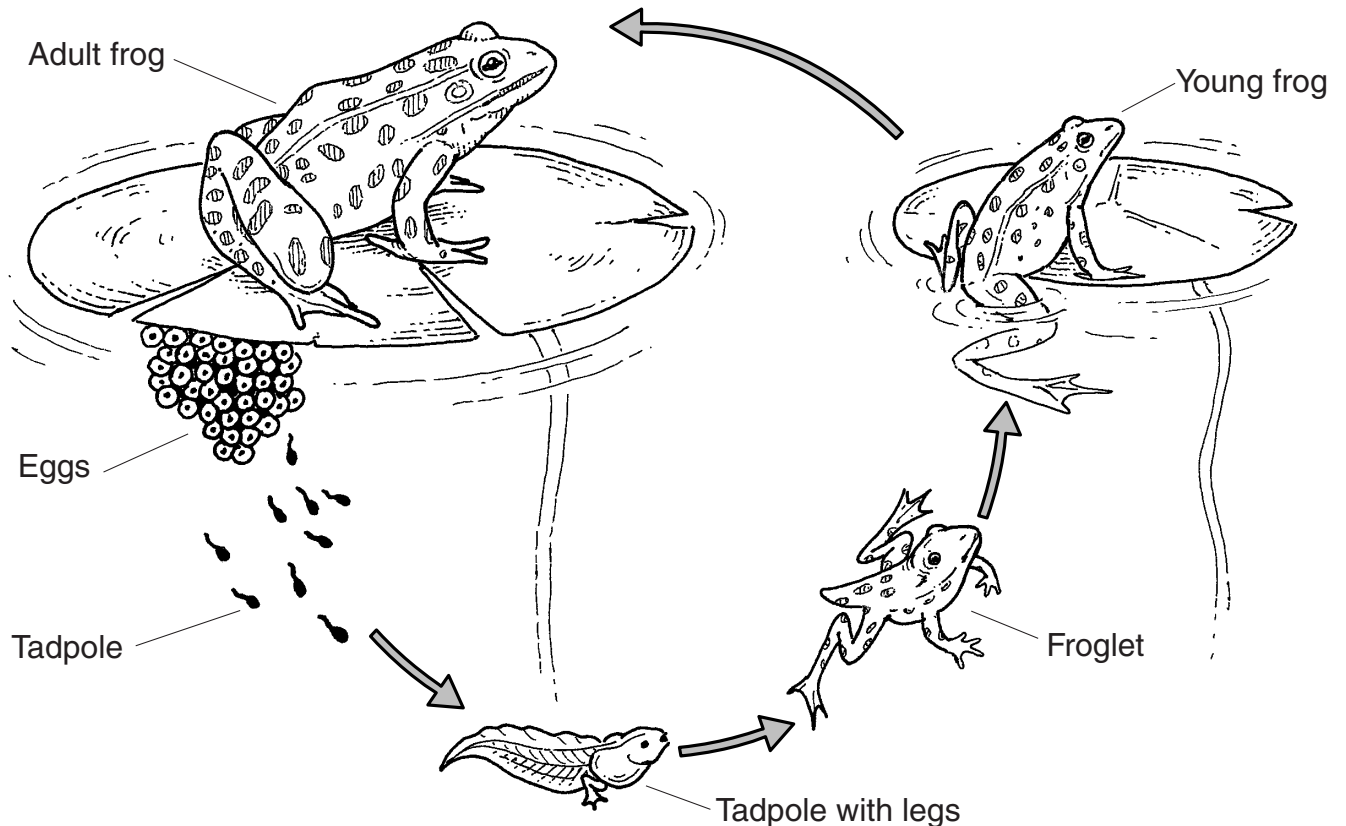


Answer Key: page 78

Cluster 1

Use the information below and your knowledge of science to help you answer questions 29–32.

The Life Cycle of a Frog



Most frogs spend part of their lives in water and part of their lives on land. A frog's skin isn't very good at holding in water, so frogs must live near water to keep their skin from drying out. Frogs usually live near lakes, streams, or ponds. Some frogs even live near small pools of rainwater. Many adult frogs eat small fish, worms, or insects that they catch with their long, sticky tongues. Frogs lay their eggs in water. When the eggs hatch, the tadpoles swim using their tails.

Question 29

Which of these adaptations makes a tadpole more suited to live in water than on land?

- A Eyes
- B Legs
- C Gills
- D Lungs



Answer Key: page 78

Question 30

How do young tadpoles get their food?

- A They drink milk produced by their mothers.
- B They capture insects in the same way their parents do.
- C They feed on small organisms, such as algae, that live in the water.
- D They use the sun's energy to make their own food.



Answer Key: page 78

Question 31

The drawing of the frog's life cycle is a type of model. This model could be improved by —

- A reversing the direction of the arrows
- B switching the froglet and the young frog
- C numbering the stages, starting with the tadpoles
- D showing how much time passes between the stages



Answer Key: page 79

Question 32

The lily pad floats on water because it —

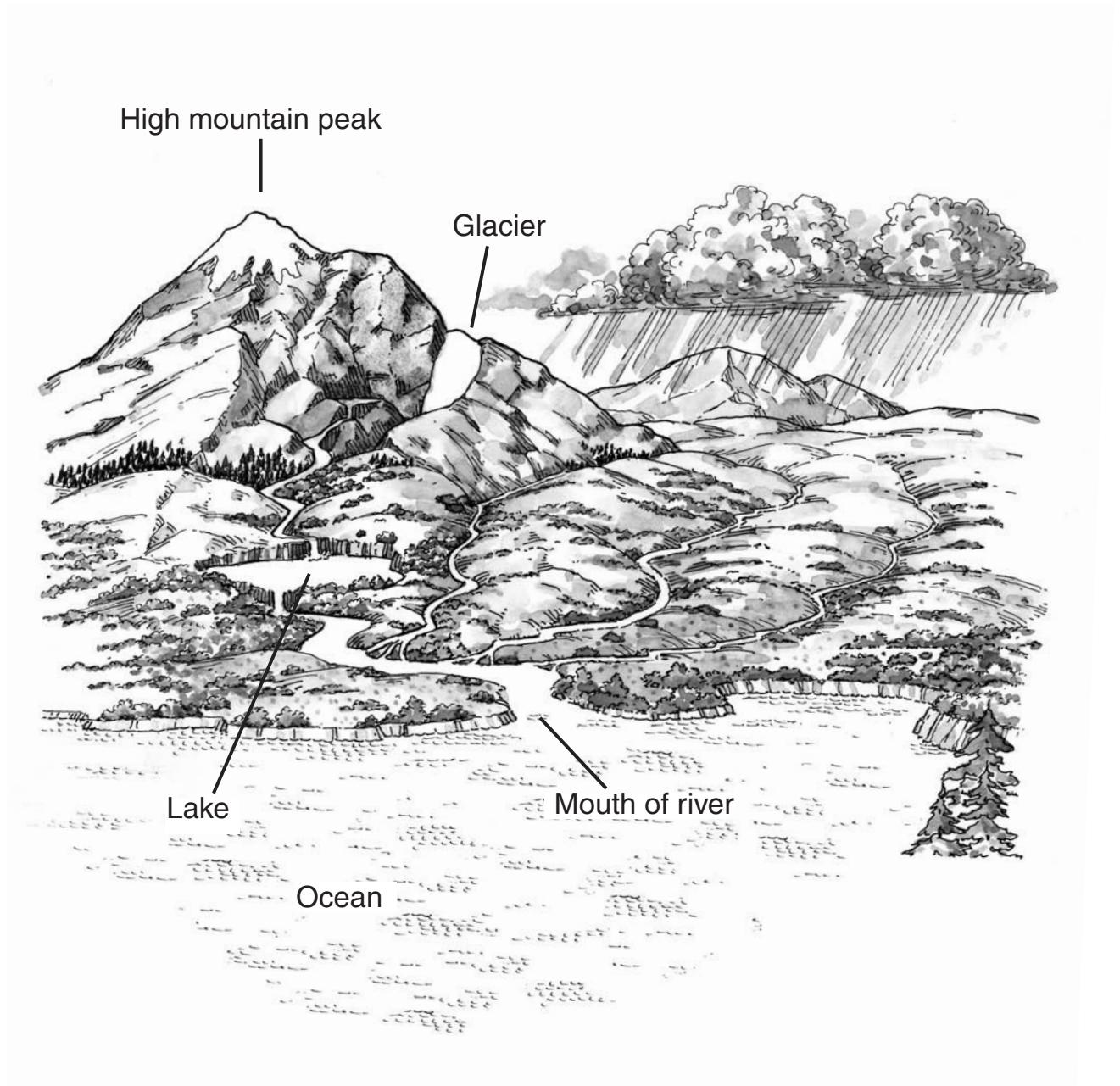
- A has small cuts in its edges
- B is less dense than the water
- C has more mass than the water
- D is colder than the surrounding water



Answer Key: page 79

Cluster 2

Use the information below and your knowledge of science to answer questions 33–35.



Question 33

One reason that trees rarely grow at the top of high mountains is that high mountain peaks —

- A are usually covered by thick grasses
- B are home to many grazing animals
- C tend to be very cold for most of the year
- D often receive a large amount of rainfall



Answer Key: page 79

Question 34

The river water is a solution because it —

- A is a liquid, which has no definite shape
- B contains dissolved minerals and salts
- C carries sand, clay, and other sediment
- D is a compound made up of two elements



Answer Key: page 79

Question 35

The rivers in the drawing have helped change the shape of the nearby hills by —

- A carrying sediment away from the hills
- B depositing rock near the top of the hills
- C bringing water to the glacier that moves over the hills
- D forming faults in the hills where earthquakes can occur



Answer Key: page 79

Science Activity

Be a trait detective!

Have you ever wondered why you don't have wings, like a bird, or claws, like a cat? The reason you don't is that you're human. And because you're human, you have only human traits—not bird traits or cat traits.

Many traits are passed from parent to child. These traits are called inherited traits. Inherited traits are controlled by genes. Half of your genes come from your mother, and half come from your father. Because your parents are human, they passed their human traits on to you, so you ended up with arms instead of wings and fingernails instead of claws.

Some inherited human traits are shared by almost everyone—having one heart, two lungs, and one head, for example. Other inherited human traits are less common. For instance, not everyone has brown eyes or naturally curly hair.

Let's look at several inherited traits and see which ones you have. Then we'll try to find out which of these traits are most common.

Which traits do you have?

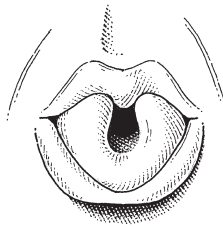
Each pair of drawings shows a pair of traits. For each pair, circle the trait that you have.

Tip:

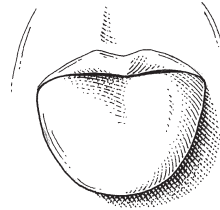
You might need to look in a mirror to see if you have some of these traits.

1. Try to curl up the sides of your tongue so that your tongue forms a U shape. Some people can't do this. Can you?

Can curl tongue



Cannot curl tongue



2. Your earlobes are the bottom parts of your ears. Look at your earlobes. Are they attached to the sides of your head, or do they hang free, like in the drawing below?

Attached earlobe

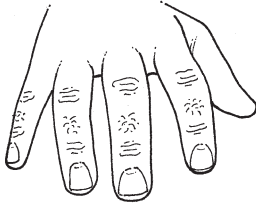


Free earlobe

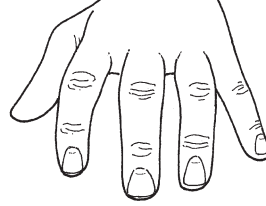


3. Look at your fingers. At the end of each finger is a fingernail. A bit closer to your hand, there are two joints, or bends, in each finger. Do you have hair on your fingers between these two joints? Some people do, and some people don't. Even if you have just one hair on one finger, you still have this trait.

Hair on fingers



No hair on fingers



4. Look at your hairline in a mirror. Your hairline is where your hair stops and your forehead starts. Does your hairline come to a point in the center of your forehead? If so, you have a widow's peak.

Widow's peak



No widow's peak



5. What color are your eyes? Are they a dark color, such as brown, or a light color, such as blue, green, or gray?

Dark eyes



Light eyes



Fill out the chart below. In the first column of the chart, write the names of eight family members or friends. Then put check marks in the boxes to show which traits each of these people has.

Name	Can curl tongue	Cannot curl tongue	Free earlobes	Attached earlobes	Hair on fingers	No hair on fingers	Widow's peak	No widow's peak	Dark eyes	Light eyes
1.										
2.										
3.										
4.										
5.										
6.										
7.										
8.										

Hint:

Don't worry if you can't find enough people to complete the chart. You can still be a trait detective. Look at the traits of people on television or in magazine photographs. Then fill in as much of the chart as you can.

Which traits are more common?

For each pair, underline the trait that is more common based on the results in your table. If the two traits are equally common, do not underline either of them.

Which trait is more common?

- Can curl tongue OR cannot curl tongue
- Free earlobes OR attached earlobes
- Hair on fingers OR no hair on fingers
- Widow's peak OR no widow's peak
- Dark eyes OR light eyes

Share your traits!

Which of the common inherited traits do you have? (The common traits are the ones you underlined above.)

What are some of your other inherited traits?

What are some of your traits that are not inherited? For example, knowing how to ride a bicycle is not an inherited trait. If you can ride a bike, you weren't born knowing how to do it. You had to learn how.

Pets have traits, too!

Which do you like better, cats or dogs? Make a list of inherited traits for the kind of animal you chose. Try to include some inherited traits that have two different forms. For example, if you chose cats, you might list fur color (light or dark), fur length (short or long), and fur pattern (striped or not striped).

Now try to find out which of these traits are more common. Look at pets in your neighborhood, in pet-food commercials, or in magazine photographs. Record your results in the chart below. A few traits have already been listed in the chart, but there is room for you to add more.

Hint:

If you need more room, you can continue the chart on your own paper.

Pet's name or place where you saw the pet	Light fur	Dark fur	Short fur	Long fur	Striped fur	No stripes				
1.										
2.										
3.										
4.										

Now look at your results. Which pet traits are more common?

Once you have completed this science activity, look at the sample results on page 80 to see how your answers compare.



Objective 1

Question 1 (page 19)

- A** Incorrect. The student would probably have to put one seed of each type in a dark area instead of in the sunny window.
- B** Incorrect. The student would probably have to plant one seed of each type in cups that are not clear plastic.
- C** Incorrect. The student would probably have to give half of the cups of each type of seeds more water than the other half.
- D** **Correct.** The only difference among the twelve cups is the types of seeds they contain. Because the student is observing the cups every day, the student can figure out the number of days it takes each type of seed to sprout.

Question 2 (page 19)

- A** Incorrect. A lab apron protects clothing from spills and stains. It does not protect your eyes.
- B** Incorrect. Though a magnifying glass can be used to see objects up close, it won't protect your eyes.
- C** Incorrect. A water bottle can be used to provide water during an experiment. It does not protect your eyes.
- D** **Correct.** Safety goggles should be worn at all times in the lab. Goggles can prevent chemicals and harmful objects from getting into the eyes.

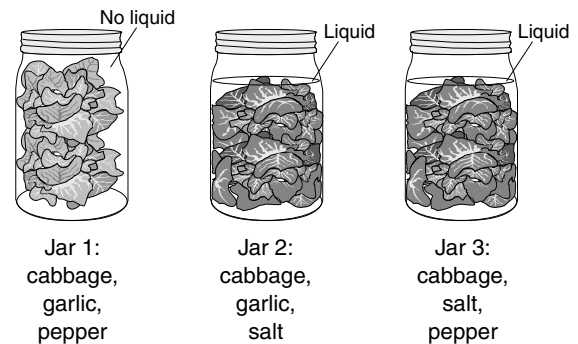
Question 3 (page 20)

- A** Incorrect. The two years with the lowest average rainfall were 1970 and 1980. The average temperature was not unusually warm in either of these years.
- B** Incorrect. The year with the lowest average temperature was 1960. Waco did not receive an unusually large amount of rain in that year.
- C** **Correct.** On these graphs the average rainfall and the average temperature do not seem to be related.
- D** Incorrect. The two graphs give no information about the number of cloudy days in Waco, Texas.

Question 4 (page 21)

- A** Incorrect. If students repeated this investigation using different-sized jars, they would not have gotten information about what caused the liquid to come out of the cabbage.

- B** Incorrect. If the students repeated this investigation using different amounts of cabbage, they would not have gotten information about what caused the liquid to come out of the cabbage.
- C** **Correct.** It is likely that liquid comes out of the cabbage because of one of the ingredients. To find out which ingredient this is, the students should have left out one ingredient at a time. The students did an experiment using the three jars below. Since there is liquid in Jars 2 and 3 and there is no liquid in Jar 1, the students know that it is the salt that made the liquid leave the cabbage.



- D** Incorrect. If students used different vegetables, they would probably find that liquid comes out of other vegetables as well.

Question 5 (page 22)

- A** **Correct.** The amount of sunlight is the only difference in the growing conditions of the plants.
- B** Incorrect. Both plants were grown indoors and most likely received the same amount of fresh air.
- C** Incorrect. Each plant was grown in the same size of clay pot.
- D** Incorrect. Plants 1 and 2 are both marigolds. Each should require about the same amount of water to grow.

Question 6 (page 23)

- A** **Correct.** All food chains begin with producers, such as green plants. Green plants make their own food using energy from sunlight. The food web shown in the drawing shows only animals. Because animals cannot make their own food, they are not producers. See page 30 for more information on food webs.
- B** Incorrect. The arrows in a food web show the direction that energy is transferred. When one organism eats another, some of the energy of the prey is transferred to the predator.

- C** Incorrect. Food webs show only the organisms in an ecosystem and how energy is transferred among them. They do not show the nonliving parts of the environment, such as rocks, water, and air.
- D** Incorrect. An organism in a food web should be connected only to those organisms that it feeds on and to the organisms that feed on it.

Question 7 (page 23)

- A** **Correct.** Most species in the fossil record are now extinct. Evidence from the fossil record suggests that the types of animals on Earth have changed over time.
- B** Incorrect. It is true that human activities have contributed to some modern extinctions, but humans were not present when most extinctions that are in the fossil record took place.
- C** Incorrect. The fossil record provides evidence that the types of organisms on Earth have changed over time. This evidence suggests that the environment on Earth has changed over time as well.
- D** Incorrect. Natural disasters have destroyed some life on Earth, but not all life. The fossil record contains evidence that life has been present on Earth in some form since the beginning of the fossil record.

Objective 2

Question 8 (page 36)

- A** Incorrect. Because the genes of all the trees were the same, the tree in the clay pot probably would have grown as tall as the others if the gardener had not kept its branches trimmed.
- B** Incorrect. The tree in the clay pot was kept small by the gardener, not because of a change in the tree's genes.
- C** Incorrect. If the trees in the garden carried genes for smallness, they would not have grown tall, no matter how much sunlight they received.
- D** **Correct.** It is likely that the tree in the clay pot would have grown tall if the gardener had not kept its branches trimmed. The small tree likely carried genes for tallness. These genes were then passed on in its seeds, which grew into tall trees.

Question 9 (page 36)

- A** **Correct.** These leaves are very narrow and needle-like. They have little area from which water can be lost to the air.

- B** Incorrect. These leaves are wide and flat and will lose more water than a leaf that is smaller and narrower.
- C** Incorrect. These leaves are wide and flat and will lose more water than a leaf that is smaller and narrower.
- D** Incorrect. This leaf is divided into many smaller leaflets. All the leaflets together provide a large area for water to be lost.

Question 10 (page 37)

- A** Incorrect. Plants do get important nutrients from the soil, but the soil does not provide energy to plants.
- B** Incorrect. The energy in milk comes from energy in the cow's food.
- C** Incorrect. The energy in grass comes from sunlight.
- D** **Correct.** The original source of energy in the food chain is sunlight. The grass makes its food by using energy from sunlight. Some of this energy is passed along the food chain, as shown in the diagram.

Sunlight → Grass → Cows → Milk → Students

Question 11 (page 37)

- A** Incorrect. This bird's beak is sharp and hooked. It is adapted for catching and tearing prey.
- B** Incorrect. This bird's beak is long and pointed. It is adapted for dipping into shallow water for frogs or fish.
- C** Incorrect. This bird's beak is long and narrow. It is adapted for reaching deep into a flower so the bird can drink nectar.
- D** **Correct.** This bird's beak is short, broad, and strong. Its beak is well adapted for cracking or crushing the shells of seeds.

Question 12 (page 38)

- A** **Correct.** If the mice were removed from the food chain, the rattlesnakes would have none of their usual food to eat, and many of them would starve.
- B** Incorrect. Rattlesnakes are not adapted to eating plants.
- C** Incorrect. A producer is an organism, such as a plant, that makes its own food. Rattlesnakes cannot make their own food.
- D** Incorrect. Without a food source, the number of rattlesnakes would decrease.

Question 13 (page 38)

- A** Incorrect. A decrease in the number of bacteria and fungi would cause a decrease in the amount of nutrients in the soil. Plants need nutrients in order to grow. If there were less nutrients in the soil, fewer plants would grow.
- B** Incorrect. Bees need flowering plants for food. If the number of bacteria and fungi decreased, the amount of nutrients in the soil would decrease, as would the number of plants. A decrease in the number of plants would mean a decrease in the number of bees.
- C** **Correct.** Bacteria and fungi break down dead organisms into simple nutrients. These nutrients are added to the soil. If the number of bacteria and fungi decreased, the amount of nutrients added to the soil would also decrease.
- D** Incorrect. The number of bacteria and fungi in the soil has little effect on the amount of water in the air.

Question 14 (page 39)

- A** Incorrect. The bird in this drawing has long legs adapted for wading in water and a long pointed bill adapted for grabbing fish. Such a bird is usually found near water.
- B** **Correct.** This drawing shows a lizard. Some lizards are well adapted to live in hot, dry areas with few plants. The skin of a lizard is covered with scales. The scales help prevent water loss from the body.
- C** Incorrect. This drawing shows a sea lion. Sea lions live in and near the ocean on beaches and rocky coasts. Notice the sea lion's flippers. They are an adaptation for swimming in water.
- D** Incorrect. This drawing shows a duck. Ducks live in and around freshwater lakes, ponds, and marshes. Notice the duck's webbed feet. They are an adaptation for moving in water.

Objective 3

Question 15 (page 51)

- A** Incorrect. Light reflected off the glass would not cause the writing to look bigger.
- B** **Correct.** The water in the glass acts like a lens that refracts, or bends, the light from the textbook and makes the writing look bigger.

- C** Incorrect. The water would absorb very little of the light and would not make the writing look bigger.
- D** Incorrect. The glass would not affect the speed of the light.

Question 16 (page 51)

- A** **Correct.** The magnetic field of an electromagnet is a result of the electric current in the wire. Therefore, the electromagnet can be turned on and off.
- B** Incorrect. Wood is not a magnetic material, so it will not be attracted by either a bar magnet or an electromagnet.
- C** Incorrect. A permanent magnet is one that keeps its magnetism for a long time and cannot be turned off.
- D** Incorrect. All magnets, including electromagnets, have one north pole and one south pole.

Question 17 (page 51)

One way to solve this problem is to look for a pattern in the data chart. When the ruler is pulled back 4 cm, the ball travels 4 m, or 4×1 . When the ruler is pulled back 5 cm, the ball travels 10 m, or 5×2 . You see that at 6 cm the ball travels 18 m, or 6×3 . At 7 cm it travels

	4	0	.
0	0	●	
1	1	1	
2	2	2	
3	3	3	
4	●	4	
5	5	5	
6	6	6	
7	7	7	
8	8	8	
9	9	9	

28 m, or 7×4 . So by using this pattern, when the ruler is pulled back 8 cm, the ball should travel 8×5 , or 40 m. *If a zero were placed in front of the 40, the response would still be correct.*

Question 18 (page 52)

- A** Incorrect. Because the electric circuit is not complete, the lightbulbs will not light up.
- B** Incorrect. Because the electric circuit is connected to only one pole of the battery, the lightbulbs will not light up.
- C** Incorrect. Because the electric circuit is not complete, the lightbulbs will not light up.
- D** **Correct.** This drawing shows a complete electric circuit. Because current flows through the circuit, the lightbulbs will light up.

Question 19 (page 52)

- A** Incorrect. Light energy from sunlight or a lamp, rather than heat energy, is used to power a solar calculator.
- B** Incorrect. A solar cell changes light energy into electrical energy, not chemical energy.
- C** **Correct.** In a solar cell, light energy from sunlight or a lamp is changed into electrical energy.
- D** Incorrect. This type of energy change occurs in a battery-powered calculator, not a solar calculator.

Question 20 (page 53)

- A** Incorrect. When salt water is heated, water boils away, and the salt stays behind. If salt and water had the same boiling point, they would both evaporate together.
- B** Incorrect. Salt water is a solution. It contains both salt particles and water particles. Salt water can be separated into salt and water by evaporating the water.
- C** Incorrect. When a liquid becomes a solid, this is called freezing.
- D** **Correct.** A solution of salt water can be separated into salt and water by evaporating the water. Evaporation is a physical change. No new substances are formed.

Question 21 (page 54)

- A** Incorrect. Sugar dissolves in water and forms a solution. When the solution is poured through a paper towel, the sugar will pass through with the water.
- B** **Correct.** Sand does not dissolve in water. When the mixture is poured through the paper towel, the sand will collect on top. Both sugar and salt dissolve in water.
- C** Incorrect. Both sugar and salt dissolve in water. They will pass through the paper towel with the water.
- D** Incorrect. The sand will collect on top of the paper towel because sand will not dissolve in water. Salt dissolves when mixed with water and will pass through the paper towel.

Objective 4**Question 22 (page 61)**

- A** Incorrect. A sea arch is a result of erosion of softer rock by waves.
- B** **Correct.** A beach is formed when waves deposit sediment, such as sand or bits of shells, on the shore.
- C** Incorrect. A wave-cut cliff is formed when waves erode the base of rock. Eventually the rock crashes into the ocean, leaving behind a steep cliff.
- D** Incorrect. A sea cave is a result of erosion of softer rock by waves.

Question 23 (page 62)

- A** Incorrect. Glaciers are masses of ice that move over land, not through caverns.
- B** Incorrect. Air does flow through some caverns but is not usually strong enough to cause erosion.
- C** Incorrect. The flow of a river would be more likely to break or dissolve stalactites than to form them.
- D** **Correct.** Stalactites are formed when groundwater seeps through cracks in the limestone above a cavern. As the water passes through the limestone, it dissolves minerals. When the water drips from the roof of the cavern, some of the minerals are deposited there. Over time the minerals build up into an icicle-shaped rock formation.

Question 24 (page 62)

- A** **Correct.** During physical weathering, rocks change shape or break up into smaller pieces. The student's model represented the physical weathering that might occur at the bottom of a stream when water causes rocks to crash into one another. The crashing of the rocks caused smaller pieces to break off.
- B** Incorrect. Chemical weathering would have included a chemical change. In the student's model the rock type stayed the same, and no chemical change took place.
- C** Incorrect. During erosion weathered rock is carried from one place to another. The rocks in the student's model did not change location. They stayed in the jar.
- D** Incorrect. Deltas are formed when rivers deposit their sediments. The sediments are carried to the delta from another location. The rocks in the

student's model did not change location. They stayed in the jar.

Question 25 (page 63)

- A** Incorrect. An increase in extinctions might mean a smaller total number of animals. If there were fewer animals, there would be less carbon dioxide produced by respiration.
- B** Incorrect. Plants remove carbon dioxide from the atmosphere and use it to make food through the process of photosynthesis.
- C** **Correct.** Green plants, such as those found in forests, remove carbon dioxide from the air during photosynthesis. If there were fewer forests, less carbon dioxide would be removed from the air, and the level of carbon dioxide would increase. Trees also release a large amount of carbon dioxide when they are burned.
- D** Incorrect. An increase in the number of solar-powered homes would likely mean a decrease in the number of homes powered by fossil fuels. Less carbon dioxide is produced when electricity is made from solar power than when electricity is made from burning fossil fuels.

Question 26 (page 64)

- A** Incorrect. The shuttle is landing after a flight.
- B** Incorrect. The shuttle is working in outer space.
- C** **Correct.** The shuttle is preparing to take off.
- D** Incorrect. The shuttle is preparing to land.

Question 27 (page 65)

- A** Incorrect. Coal takes millions of years to form. It cannot be replaced in a short period of time. Coal is a nonrenewable resource.
- B** Incorrect. Only a limited amount of gold exists on Earth.
- C** Incorrect. In some places, trees are cut down faster than new trees can grow.
- D** **Correct.** Wind is an inexhaustible resource. It cannot be used up. No matter how much wind energy people use, the wind will still continue to blow.

Question 28 (page 65)

- A** Incorrect. The changes described could occur in a single day. Climate is the regular pattern of weather in an area over many years.

- B** Incorrect. The changes described are not related to landforms. They are weather changes.
- C** Incorrect. A change in season is caused by Earth's position in its orbit around the sun.
- D** **Correct.** Wind direction, air pressure, and cloud cover are part of an area's weather conditions. Changes in these conditions can occur suddenly.

Cluster 1

Question 29 (page 67)

- A** Incorrect. Many animals have eyes, including both water animals and land animals.
- B** Incorrect. Some water animals have legs, but so do many land animals.
- C** **Correct.** Gills help tadpoles breathe, or take in oxygen, underwater. Many animals that live in water have gills. This adaptation makes tadpoles more suited to living in water than on land.
- D** Incorrect. Tadpoles do not have lungs, but adult frogs do. Lungs help animals breathe in the air. An adult frog's lungs make it more suited to living on land than underwater.

Question 30 (page 67)

- A** Incorrect. Only mammals produce milk for their young. Frogs are amphibians, not mammals.
- B** Incorrect. Adult frogs and tadpoles have very different bodies, so it is likely that adult frogs and tadpoles eat different types of food.
- C** **Correct.** Many tadpoles feed on green algae. Most green algae are one-celled organisms that live in water. Many adult frogs eat small fish, worms, or insects. These animals would be too large for tadpoles to catch and eat.
- D** Incorrect. Tadpoles are animals. Animals cannot make their own food. Instead, animals must find and eat their food.

Question 31 (page 67)

- A** Incorrect. The arrows point from younger stages to older stages, so the direction of the arrows in the model is correct.
- B** Incorrect. A froglet is a younger stage than a young frog. A froglet still has a short tail, but a young frog does not. The order of the froglet and the young frog in the model is correct.
- C** Incorrect. If you started the numbering with the tadpoles, this would suggest that a tadpole is the earliest stage in a frog's life. However, an egg, not a tadpole, is the first stage in a frog's life.
- D** **Correct.** In science a model is used to represent something in nature. One way to improve this model would be to add more information. The length of each stage in this frog's life cycle would help viewers understand the life cycle better.

Question 32 (page 67)

- A** Incorrect. A lily pad leaf may or may not have these cuts. Even without the cuts, the leaf would still float.
- B** **Correct.** When an object is less dense, it will float on the more dense substance.
- C** Incorrect. The water in the pond would have much more mass than the lily pad.
- D** Incorrect. The temperature of the lily pad would not affect its ability to float.

Cluster 2

Question 33 (page 69)

- A** Incorrect. Very few plants grow on the top of high mountains because of the cold temperatures and thin soil.
- B** Incorrect. Grazing animals feed on plants, but very few plants grow on top of high mountains. So grazing animals will not live where they can't find food.
- C** **Correct.** Many high mountain peaks are very cold. Water at the top of high mountains is often frozen into ice or snow throughout much of the year. Plants cannot take in water through their roots if the water is frozen.
- D** Incorrect. Trees need water to grow. Trees would be more likely to grow in an area that received a lot of rainfall. High mountain peaks, however, do not receive much rainfall. Most of the water that falls on high peaks is in the form of snow.

Question 34 (page 69)

- A** Incorrect. Many liquids, such as pure water, are not solutions. If a liquid does not contain a dissolved substance, it is not a solution.
- B** **Correct.** The chemical weathering of rock causes many minerals and salts to gradually dissolve in water. When one substance dissolves in another, a solution is formed.
- C** Incorrect. Types of sediment such as sand and clay do not dissolve in water. A mixture of water and sediment is not a solution because the sediment can be separated from the water with a filter.
- D** Incorrect. A solution is a mixture that contains one substance dissolved in another. A compound is a single substance made up of two or more elements.

Question 35 (page 69)

- A** **Correct.** The moving water of the rivers picks up rocks and sediment from the hills and deposits them downstream or in the ocean. Over time this action can change the shape of nearby hills.
- B** Incorrect. Rivers flow downhill. They carry rock and sediment from the slopes of the hills and deposit them downstream or in the ocean.
- C** Incorrect. The glacier in this drawing is near the top of a high mountain peak. Rivers flow downhill, so they carry water away from the glacier rather than toward it.
- D** Incorrect. A fault is a break in Earth's crust where large sections of rock move past one another. Faults are formed by strong forces within Earth's crust, not by rivers.

Activity

Which traits do you have? (page 70)

You should have circled the traits that you have. You should have circled five traits in all, one from each pair.

The way your chart looks depends on the traits of the people you studied. Here is an example of part of a completed chart.

Name	Can curl tongue	Cannot curl tongue	Free earlobes	Attached earlobes	Hair on fingers	No hair on fingers	Widow's peak	No widow's peak	Dark eyes	Light eyes
1. Michelle	✓		✓			✓		✓	✓	
2. Robert	✓			✓	✓			✓		✓

Which traits are more common? (page 72)

You should have underlined the more common trait in each pair. If both traits in a pair were equally common, you should not have underlined either of them.

Share your traits! (page 72)

Which of the common inherited traits do you have? You should have listed the common traits that you share.

What are some of your other inherited traits? There are many inherited traits, so there are many that you could have listed. Here are just a few examples: naturally curly hair, dimples, and freckles. Make sure that you didn't list any traits that are *not* inherited. Remember, inherited traits are passed from parents to children in genes.

What are some of your traits that are not inherited? There are many traits that you might have listed. Here are a few examples of traits that are *not* inherited: having pierced ears, knowing how to read Spanish, and having painted fingernails. These are traits that you weren't born with.

Pets have traits, too! (page 73)

Make a list of inherited traits for cats or dogs. There are many inherited traits you might have listed. Here are a few inherited traits of cats: whiskers, clawed paws, eye color (yellow, green, or blue), tail width (thick or thin), and nose color (pink or dark). And here are a few inherited traits of dogs: pointed teeth, good sense of smell, eye color (dark or light), size (small, medium, or large), and nose color (black or brown).

The way your chart looks will depend on the type of pet you chose and on the traits of the pets you looked at. Here is an example of part of a completed chart.

Pet's name or place where you saw the pet	Light fur	Dark fur	Short fur	Long fur	Striped fur	No stripes	Thick tail	Thin tail	Pink nose	Dark nose
1. Mittens (Mr. Wilson's cat)	✓			✓		✓	✓			✓
2. Cat on Mighty Meow TV ad	✓		✓		✓			✓	✓	

Which pet traits were more common? You should have listed the traits that were shared by more than half of the pets you looked at.

TAKS STUDY GUIDE EVALUATION FORM

To complete the survey online, go to <http://www.etesttx.com/studyguides/feedback.htm>.

- ① Place a (✓) next to all statements that apply to you.

<p>I am a</p> <p>___ Student</p> <p>___ Parent</p> <p>___ Teacher</p> <p>___ Tutor</p> <p>___ Other (please specify) _____</p> <p>_____</p> <p>_____</p>	<p>I used this study guide</p> <p>___ Alone</p> <p>___ With a family member</p> <p>___ With a tutor</p> <p>___ With a teacher</p> <p>___ With a friend</p>
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② Study Guide Questions

Use a (✓) to mark how much you agree with the following statements.

	Strongly Agree	Agree	No Opinion	Disagree	Strongly Disagree
1. This study guide is easy to use and well organized.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
2. This study guide is interesting.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
3. I gained new knowledge and skills by using this study guide.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
4. I will be able to apply what I've learned from this study guide when I take the TAKS again.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>
5. I believe my TAKS scores will improve as a result of using this study guide.	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>

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③ General Information

Use a (✓) to mark the grade and subject of this study guide.

Grade:

- ___ 3 ___ 8
- ___ 4 ___ 9
- ___ 5 ___ 10
- ___ 6 ___ 11 (Exit Level)
- ___ 7

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- ___ English Language Arts
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